**OVERVIEW**

Curative treatment options for early-stage HCC (BCLC 0 or A) include transplantation, surgical resection and RF ablation with good survival outcomes ranging between 60-80%\(^*\), however many patients are not candidates for these therapies

- Radiation segmentectomy is the application of selective ablative radiation doses of Yttrium-90 (Y-90) to tumors, usually delivered to no more than two hepatic segments\(^2\)
- The threshold dose of 190 Gy has been confirmed\(^3\) to maximize cytotoxicity and selective delivery minimizes risk of damage to surrounding parenchyma\(^4\)

**OBJECTIVES**

- To report one center’s long term outcomes of patients with HCC ≤ 5 cm, not amenable to transplantation, resection or RF ablation, who underwent radiation segmentectomy
- The authors hypothesized radiation segmentectomy could be considered potentially curative based on the same rationale as transplantation, resection and RF ablation

**METHODS**

- Retrospective, single center study looked at 70 patients with solitary HCC ≤ 5 cm, preserved liver function (Child Pugh A) and no vascular invasion or extrahepatic metastases who underwent radiation segmentectomy with Y-90 glass microspheres (target dose >190 Gy)
- Patients who had surgical resection or transplant after a radioembolization procedure were excluded
- A sub-analysis of patients with HCC ≤ 3 cm was also performed (cohort comparable to RF ablation)
- All patients underwent long-term imaging (contrast material-enhanced magnetic resonance [MR] imaging or computed tomography [CT]) and clinical follow-up (toxicity assessment at 1 and 3 months and response assessment in clinic 1 month post and subsequently at 3-month intervals)

**KEY RESULTS**

<table>
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<tr>
<th>RADIOGRAPHIC RESPONSE</th>
<th>TIME TO PROGRESSION (TTP)</th>
<th>LOCAL TUMOR CONTROL</th>
<th>OVERALL SURVIVAL (OS)</th>
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<td>63 out of 70 patients (90%) responded according to EASL criteria, of whom 41 (59%) showed complete response (CR).</td>
<td>Median TTP was 2.4 years, or 29 months.</td>
<td>72% of patients had no target lesion progression at 5 years. Local recurrence in complete responders occurred in 4 patients (9.8%).</td>
<td>Median OS (n=70) was 6.7 years, or 80 months. 1-, 3-, and 5-year survival probabilities were 98%, 66% and 57%, respectively. A sub-analysis of patients with tumor size ≤ 3 cm (n = 45) resulted in 1-, 3-, and 5-year survival probabilities of 100%, 82% and 75%, respectively.</td>
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\(^*\) RF ablation shows similar reported survival outcomes to resection and transplantation for HCC ≤ to 3 cm

BCLC = Barcelona Clinic Liver Cancer; HCC= hepatocellular carcinoma; RF= radiofrequency; EASL= European Association for the Study of the Liver
CONCLUSION

- Liver transplantation, surgical resection and RF ablation are considered curative treatment options based on phase II randomized studies with limited data demonstrating improved survival.

- Radiation segmentectomy data from the present publication showed similar outcomes as curative treatments in patients with unablative BCLC stage 0 or A lesions ≤ 5cm with preserved liver function (Child Pugh A):
  - Provided local tumor control
  - Prolonged time to progression
  - Overall survival outcomes comparable to RF ablation, resection, and transplantation for patients with BCLC stage 0 or A HCC

- Additionally, radiation segmentectomy is an outpatient, minimally invasive intra-arterial therapy with a low toxicity profile that may be a convenient treatment option for patients.

- Study Strengths: homogeneity of patient cohort, >10 years of follow-up, strict patient selection

- Study Limitations: retrospective and nonrandomized analysis, selection bias, comparisons to published literature versus an internal control group


TheraSphere® Y-90 Glass Microspheres

INDICATIONS FOR USE: TheraSphere is indicated as an adjuvant to locoregional radiation therapy (SRT) for locoregional control of solitary (≤ 5 cm in diameter) patients with unresectable hepatocellular carcinoma (HCC). Child-Pugh Score A cirrhotic, well-compensated liver function, no man-made varices, and good performance status.

DOSAGE/ADMINISTRATION: TheraSphere is contraindicated in patients whose tumor-to-blood ratio greater than 1.5 or microspheres are unable to perfuse the tumor. Microspheres can be delivered in volumes from 5 mL to 15 mL, or a single dose of 11 mCi (0.41 GBq) or 22 mCi (0.82 GBq) of Y-90 may be administered, as determined by the attending physician. The maximum single dose of TheraSphere is 44 mCi (1.6 GBq). The maximum cumulative dose is 132 mCi (4.8 GBq).

CAUTION:
Federal (USA) law restricts this device to sale by or on order of a physician. PI-992004-AA.

RESULTS

Contrast material-enhanced CT scan before Y-90 of an 87-year-old man with 4 cm hepatocellular carcinoma in right lobe.

Contrast-enhanced MRI image at subsequent 9-year follow-up (now aged 96 years) shows complete necrosis.