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THERASPHERE™ Y-90 Glass Microspheres | PUBLICATION SUMMARY

Radiation Segmentectomy: Potential Curative Therapy for Early Hepatocellular Carcinoma

Radiology, 2018 Jun; 287(3); https://pubs.rsna.org/doi/10.1148/radiol.2018171768 Lewandowski RJ, Gabr A, Abouchaleh N, Ali R, Al Asadi A, Mora RA, Kulik L, Ganger D, Desai K, Thornburg B, Mouli S, Hickey R, Caicedo JC, Abecassis M, Riaz A and Salem R

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%*[1], 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)

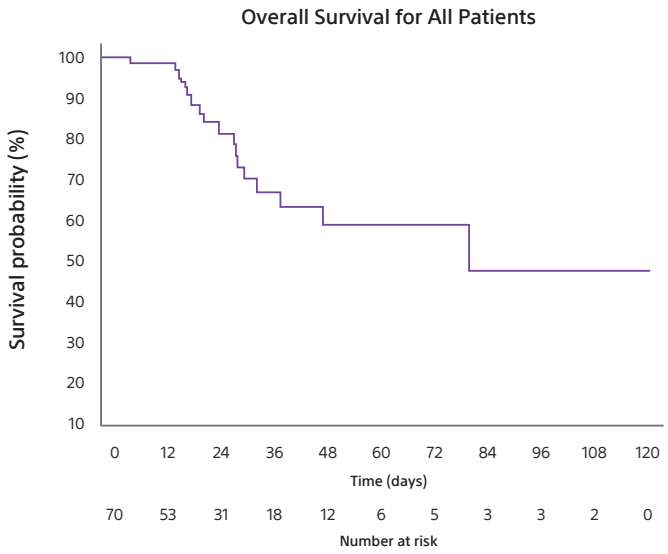
KEY RESULTS

RADIOGRAPHIC RESPONSE	TIME TO PROGRESSION (TTP)	LOCAL TUMOR CONTROL	OVERALL SURVIVAL (OS)
63 out of 70 patients (90%) responded according to EASL criteria, of whom 41 (59%) showed complete response (CR).	Median TTP was 2.4 years, or 29 months.	72% of patients had no target lesion progression at 5 years. Local recurrence in complete responders occurred in 4 patients (9.8%).	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.

* RF ablation shows similar reported survival outcomes to resection and transplantation for HCC ≤ to 3 cm

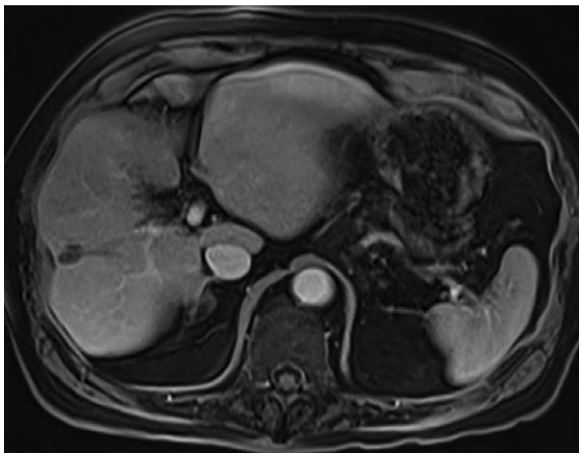
BCLC = Barcelona Clinic Liver Cancer; HCC= hepatocellular carcinoma; RF= radiofrequency; EASL= European Association for the Study of the Liver

RESULTS



OVERALL SURVIVAL RATE	Tumor Sizes		
	≤ 3cm (n=45)	> 3cm (n=25)	All ≤ 5cm (n=70)
1-year	100%	96%	98%
3-year	82%	46%	66%
5-year	75%	37%	57%

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



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

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 therapies considered curative in patients with unablatable 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

1. Bruix J, Reig M, Sherman M. Evidence-based diagnosis, staging, and treatment of patients with hepatocellular carcinoma. Gastroenterology 2016;150(4):835-853 **2.** Riaz A, Gates VL, Atassi B et al. Radiation segmentectomy: a novel approach to increase safety and efficacy of radioembolization. Int J Radiat Oncol Biol Phys 2011;79(1):163-171 **3.** Vouche M, Habib A, Ward TJ et al. Unresectable solitary hepatocellular carcinoma not amenable to radiofrequency ablation: multicenter radiology-pathology correlation and survival of radiation segmentectomy. Hepatology 2014;60(1):192-201 **4.** Vouche M, Lewandowski RJ, Atassi R et al. Radiation lobectomy: time-dependent analysis of future liver remnant volume in unresectable liver cancer as a bridge to resection. J Hepatol 2013;59(5):1029-1036

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