2023 APPLE
The 13th Asia-Pacific Primary Liver Cancer Expert Meeting
Novel Insights into the Evolution of Liver Cancer Management
July 6-8, 2023 | Grand InterContinental Seoul Parnas, Seoul, Korea

Feasibility and Efficacy of Repeated Stereotactic Body Radiotherapy for Recurrent Hepatocellular Carcinoma

Won Il Jang[1], Mi-Sook Kim[1], Chul Ju Han[2], Jin Kim[2], Su Cheol Park[2],
Sang Bum Kim[3], Eung-Ho Cho[3]

Department of Radiation Oncology[1], Internal Medicine[2], Surgery[3],
Korea Institute of Radiological and Medical Sciences, Seoul, South Korea

Aim

- The aim of this study is to evaluate the feasibility and efficacy of repeated stereotactic body radiotherapy (SBRT) for inoperable recurrent hepatocellular carcinoma (HCC).

Materials and Methods

- Inclusion Criteria
  (1) Diagnosis of HCC by KLCSG guideline 2014
  (2) ≤ 3 discrete recurrent liver tumors
  (3) SBRT as the initial radiotherapy administered
  (4) ECOG performance score ≤ 2
  (5) Age ≥ 20
  (6) Unsuitable for resection, transplant or RFA
  (7) Unsuitable for or refractory to TACE
  (8) Liver function classified as CTP score A5–B8

Materials and Methods

- January 2004 – May 2014
- 548 HCC patients with SBRT in KCCH
- 28 HCC patients with Re-SBRT
- F/U duration : median 11 months (range; 2–56)
- SBRT dose
  - 1st SBRT : median 51 Gy (range, 30-60 Gy/3–5 Fx)
  - Re-SBRT : median 44 Gy (range, 30–60 Gy/3-4 Fx)

Patient Characteristics

Variable		Number of patients (%)
Age (years)	≤ 60	12 (43)
	> 60	16 (57)
	Median (range)	64 (25–77)
ECOG PS	0,1	27 (96)
	2	1 (4)
Etiology	HBV	19 (68)
	HCV	4 (14)
	NBNC	5 (18)
Liver cirrhosis	No	3 (11)
	Yes	25 (89)
Child Pugh class	A5	21 (75)
	A6	5 (18)
	B7	1 (4)
	B8	1 (4)

Variable		Number of patients (%)
Alpha-fetoprotein (IU/ml)	≤ 200	19 (68)
	> 200	9 (32)
PVTT	No	22 (79)
	Yes	6 (21)
BCLC stage	A	10 (36)
	B	5 (18)
	C	13 (46)
Extrahepatic metastasis	No	21 (75)
	Yes	7 (25)
In-field failure after the 1st SBRT	No	1 (4)
	Yes	27 (96)
Tumor volume (ml)	≤ 15	14 (50)
	> 15	14 (50)
	Median (range)	14.7 (0.8–356.7)

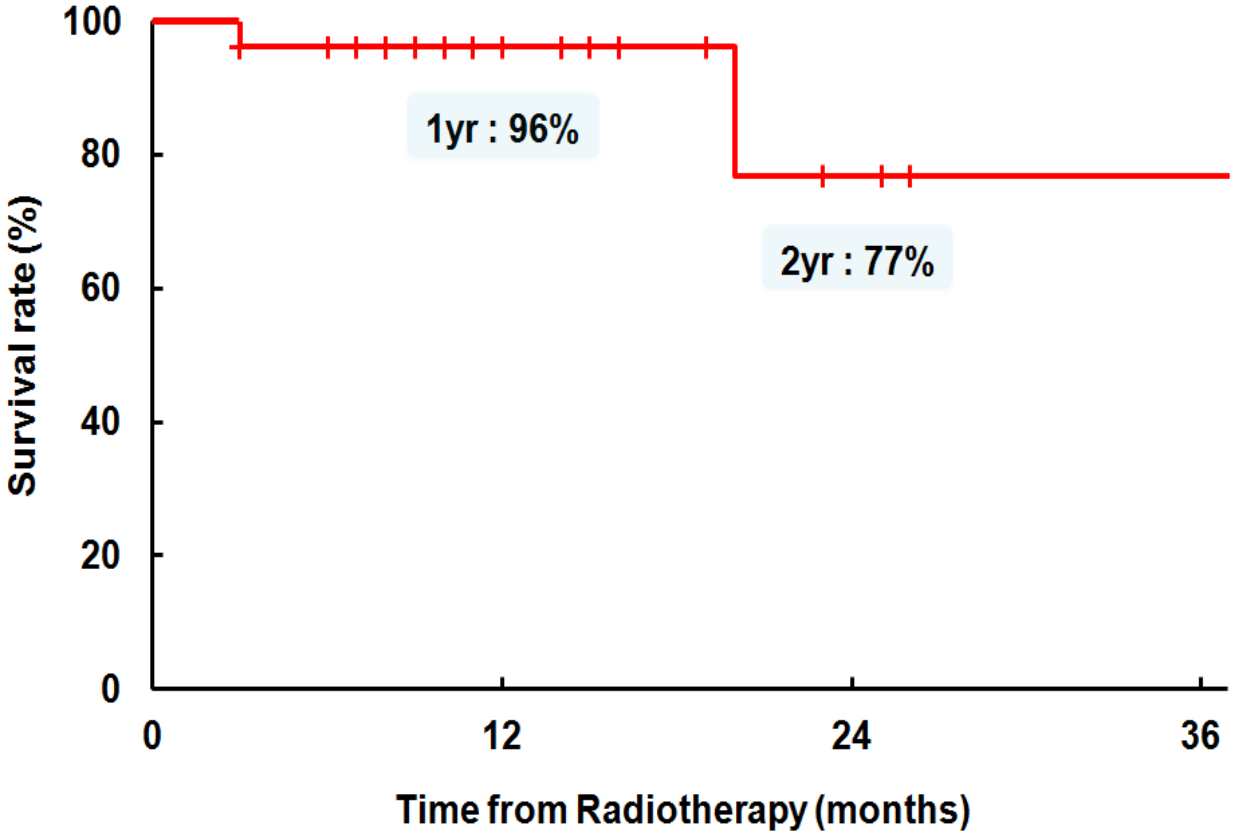
Treatment Characteristics

Variable		Number of patients (%)
Interval b/w 1st and Re-SBRT (months)	≤ 6	8 (29)
	> 6	20 (71)
	Median (range)	11 (2–48)
Combined treatment (Re-SBRT)	TACE	13 (46)
	Sorafenib	1 (4)
	No	14 (50)
Aim of Re-SBRT	Curative	21 (75)
	Palliative	7 (25)
BED (Gy10) (Re-SBRT)	≤ 100	10 (36)
	> 100	18 (64)
	Median (range)	106.7 (60–180)

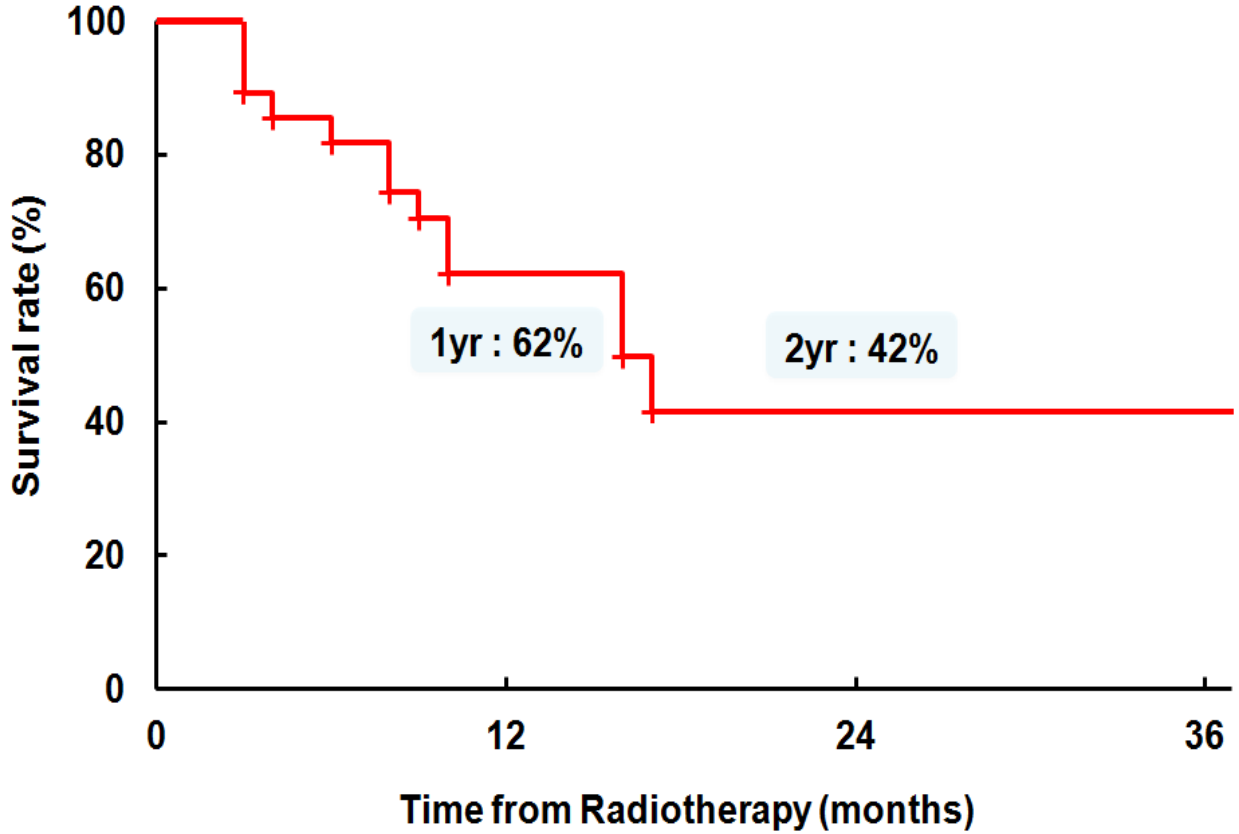
Variable		Number of patients (%)
Normal liver volume (ml) (Re-SBRT)	≤ 1000	12 (43)
	> 1000	16 (57)
	Median (range)	1031.8 (626.8–1541.8)
rV17 of normal liver (ml) (Re-SBRT)	≤ 700	3 (11)
	> 700	25 (89)
	Median (range)	915.0 (602.4–1439.8)
rV10 of normal liver (ml) (Re-SBRT)	≤ 700	8 (29)
	> 700	20 (71)
	Median (range)	769.3 (502.8–1299.8)
Mean normal liver dose (Gy3)		
1st SBRT	Median (range)	16.6 (3.7–35.5)
Re-SBRT	Median (range)	9.4 (1.6–42.0)
Total	Median (range)	27.4 (8.1–46.5)

Results

- Local failure-free survival



- Overall survival



Results

- Within 3 months of Re-SBRT w/o disease progression

- No Gr 3–4 toxicity by NCI-CTCAE v4.0, No classic RILD

- Non-classic RILD in 3 patients

Sex/ Age	Interval (months)	SBRT	CP	Site	GTV (ml)	Dose /Fx	Normal liver volume (ml)	rV17 (ml)	rV10 (ml)	Mean liver dose (Gy3)
M/65	45	1st	A5	S5/6	18	54/3	1573.0	1349.2	1168.2	9.5
		Re	A5	S7	42.2	51.9/3	1113.8	898.8	656.4	22.5
F/65	29	1st	A6	S7	9.1	60/3	1111.8	929.0	805.6	18.4
		Re	A6	S4/5	23.5	57/3	1001.7	891.5	760.8	14.7
M/77	41	1st	A5	S8, S6	57.3	45/3	832.5	653.9	496.8	23.8
		Re	A5	S7	9.4	42/3	713.3	656.8	569.7	9.4

Results

Dosimetric parameter		No. with Toxicity/ No. of Total pts	*P*-value
Interval b/w 1st and Re-SBRT	≤ 6 months > 6 months	0/8 3/20	0.246
Normal liver volume (Re-SBRT)	≤ 1000 ml > 1000 ml	1/12 2/16	0.804
rV17 of normal liver (Re-SBRT)	≤ 700 ml > 700 ml	1/3 2/25	0.180
rV10 of normal liver (Re-SBRT)	≤ 700 ml > 700 ml	2/8 1/20	0.122
Mean normal liver dose (Re-SBRT)	≤ 10 Gy3 > 10 Gy3	2/14 1/14	0.541
Mean normal liver dose (Total, 1st and Re-SBRT)	≤ 32 Gy3 > 32 Gy3	0/16 3/12	0.034

Conclusion

- Repeated SBRT can be safely and effectively administered to the patients with inoperable HCC.
- Repeated SBRT might be considered a salvage treatment.
- We suggest the total mean normal liver dose constraint of 32 Gy3 or less for the patients with Repeated SBRT .
- Further large-scale studies and longer follow-up are needed to determine the optimal dose-volume constraints and characterize late complications.