Selective internal radiotherapy (SIRT): Current indications, technique and outcome

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Disclosure

Speaker name: Michael Moche

I have the following potential conflicts of interest to report:

- Consulting
- Employment in industry
- Stockholder of a healthcare company
- Owner of a healthcare company
- Other(s)

☑ I do not have any potential conflict of interest
Multimodal therapy approach for liver cancer

Curative treatment

LTX
Resection

RFA
& others

TACE
SIRT

CT

Local control / Bridging

Local control / Palliation
Radiotherapy of liver cancer

- 30 Gy: In liver parenchyma low risk of RILD (<5%)
- 43 Gy: CRC
- 50 Gy: HCC
- 70-90 Gy: SIRT
Backround

- Double blood supply of liver
- Tumor perfusion > 80% arterial
- $^{90}$Y-labeled microsphere ($\approx 30\mu$m diameter)
- $\beta$-emission (0.93MeV)
- Half-life 64.2 h
- Tissue penetration $\varnothing$ 2.5 mm, max. 10 mm
- Tumor dose up to 100-1000Gy
Preparation, Technique and Workflow

**Preparation**
- CT of MR-Imaging for planning
- Interdisciplinary tumor board decision

**Technique and Workflow**

1. Evaluation
- Coilembolisation of extrahepatic feeders (A. gastroduodenalis, A. hep. dextra, A. cystica)
- $^{99m}$Tc-MAA -injection in final catheter position and SPECT
- Calculation of the lung shunt from SPECT
- Volumetry of liver (CT) for dose calculation

2. Therapy (1-3 weeks later)
- DSA A. hepatica for extrahepatic feeders
- Application of $^{90}$Y-labeled microsphere
Indications

- advanced liver tumors that are not (yet) resectable
- “Liver-dominant” or “liver-only” disease
- hypervascular tumours
- not suitable for RFA or others
- ECOG performance status 0-2
- Life expectancy > 3 months
<table>
<thead>
<tr>
<th>„favourable“</th>
<th>„inbetween“</th>
<th>„unfavourable“</th>
</tr>
</thead>
<tbody>
<tr>
<td>normal liver function</td>
<td>Bilirubin &lt; 2-3 mg/dl</td>
<td>Bilirubin &gt; 2-3 mg/dl</td>
</tr>
<tr>
<td>ECOG 0-1</td>
<td>ECOG 1-2</td>
<td>ECOG &gt; 2</td>
</tr>
<tr>
<td>no extrahep. MTS</td>
<td>few extrahep. MTS</td>
<td>massive extrahep. MTS</td>
</tr>
<tr>
<td>no visceral shunts</td>
<td>„coilable“ shunts</td>
<td>persisting shunts</td>
</tr>
<tr>
<td>no lung shunt</td>
<td>relevant lung shunt</td>
<td>lung dose &gt; 30 Gy</td>
</tr>
<tr>
<td>hypervascularisation</td>
<td>low hypervasc.</td>
<td>no hypervasc.</td>
</tr>
<tr>
<td>no prior SIRT</td>
<td>1x SIRT</td>
<td>2x SIRT</td>
</tr>
</tbody>
</table>

SIRT - Moche
## Outcome for HCC

<table>
<thead>
<tr>
<th>Progression Analyses</th>
<th>TACE (n)</th>
<th>TARE-Y90 (n)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTP Overall (mo)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child-Pugh A</td>
<td>17.5</td>
<td>22.1</td>
<td>.13</td>
</tr>
<tr>
<td>Child-Pugh B</td>
<td>17.4</td>
<td>17</td>
<td>.7</td>
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<tr>
<td>BCLC A</td>
<td>45.4</td>
<td>27.3</td>
<td>.74</td>
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<tr>
<td>BCLC B</td>
<td>17.5</td>
<td>17.2</td>
<td>.42</td>
</tr>
<tr>
<td>BCLC C</td>
<td>9.3</td>
<td>22.1</td>
<td>.04</td>
</tr>
</tbody>
</table>

**4x less frequent PES than in TACE**

30-day mortality low (~3%)
Seidensticker R et al. (2012) Cardiovasc Intervent Radiol
Matched-Pair Comparison of Radioembolization Plus Best Supportive Care Versus Best Supportive Care Alone for Chemotherapy Refractory Liver-Dominant Colorectal Metastases
Example

Baseline

Follow Up

3 months

Target I

Target II
Take home

- SIRT essential treatment option for HCC and mCRC
- Significant survival benefit vs. TACE in advanced HCC
- Significant survival benefit vs. BSC for CT refractory mCRC
- ESMO 2014 guidelines
- Interdisciplinary decision and cooperation is crucial for effective workflow and good clinical results

Acknowledgement: J. Fuchs, TO Petersen, S Purz, T Lincke
Title: SIRT – Selective Internal Radiotherapy

Patient: male, 58 years

History:
- NASH Liver cirrhosis (Child B, MELD 7)
- Portal hypertension
- Advanced multifocal Hepatocellular Carcinoma of the right lobe (BCLC stage C)
- Initial diagnosis 09/2013
- 7 x TACE

Image findings:
- 12 / 2014 Multifocal, progressive disease
Late phase MRI with Primovist®
CT based volumetry and dose calculation

VOL: 822.2 ± 21.6 cc, AV: 44.3 HU, SD: 56.3 

2.344 GBq
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