Irreversible electroporation – current role in percutaneous tumor ablation

Focus session: Interventional oncology and embolisation therapies – Liver (part I)

Prof. Ph. Wiggermann - Institut für Röntgendiagnostik und Nuklearmedizin
Irreversible electroporation (IRE)
IRE: non thermal ablation technique
IRE: What's the difference
Irreversible electroporation – current role in percutaneous tumor ablation

• Surgical resection – lack of data (no phase III trials)
• Not an alternative for thermal ablation – intervention time/ efficacy

• Niche modality for specific indications in case of CI thermal ablation
  • perivascular
  • peribiliary
  • proximity to vital structures
Beyer LP et al. (2016) Stereotactically-navigated percutaneous Irreversible Electroporation (IRE) compared to conventional IRE: a prospective trial. PeerJ 4:e2277
<table>
<thead>
<tr>
<th>Lead Author</th>
<th>Center</th>
<th>Year</th>
<th>Type of Study</th>
<th>Response Assessment</th>
<th>Number of Patients</th>
<th>Number of Treatments</th>
<th>Number of Lesions</th>
<th>Tumor Types</th>
<th>Tumor Size Range (Median)</th>
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<tr>
<td>Cannon</td>
<td>University of Louisville</td>
<td>2012</td>
<td>Multi Institutional Registry</td>
<td>Imaging Follow Up</td>
<td>44</td>
<td>48</td>
<td>44</td>
<td>20 CRC; 14 HCC; 10 Other</td>
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<td>Cheung</td>
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<td>18</td>
<td>HCC</td>
<td>10-61 (Mean 24)</td>
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<td>CRC</td>
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<td>Surgical Resection</td>
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<td>10</td>
<td>CRC</td>
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<td>Explant of Livers</td>
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<td>6</td>
<td>HCC</td>
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<td>6</td>
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<td>103</td>
<td>HCC; mets 35</td>
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<td>87</td>
<td>75</td>
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<td>38</td>
<td>23 CRC; 8 HCC; 8 Other</td>
<td>8-40 (Median 24)</td>
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</tbody>
</table>

IRE Efficacy:
HCC not Amenable to Thermal Ablation Techniques
IRE: CA was 77.3% after one procedure, 89.3% after two procedures, and 92% after three procedures
IRE: PFS 6- and 12-mon - 87% and 70%
TACE: CR (7month) of up to 31% within the Milan criteria

IRE Liver: Evidence

sparse data – single center – retrospective – inhomogeneous patient groups – mainly safety and short term efficacy

- no RCT

Efficacy of Irreversible Electroporation (IRE) for Central Colorectal Liver Metastases COLDFIRE-I and COLDFIRE-2

10 pat – ablate and resect (1,5 h)

40 pat - single arm - “the local control rate is good and improving... rel. high number of early distant recurrence.."
FUTURE

Electric Field

~1kV/cm

~50V/cm

Degree of Electroporation

Irreversible

Reversible

No Electroporation

~100us Pulse Length

~20ms

Hasio et al. Journal of Medical Ultrasound
Volume 25, Issue 4, December 2017, Pages 195-200

Electroporation Based Drug Delivery and Its Applications - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Different-application-of-single-cell-electroporation-When-external-applied-electric_fig6_236951789 [accessed 21 Jan, 2019]
Questions?

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