21 Chiba needle

300 μm fiberoptic

16-18 mm charring

45°C

8-10 mm

16-18 mm

Interstitial Laser Standard Damage Effect
Laser Ablation Planning.
Three Fibres, Isoscele Diedric Shape
Laser Ablation in benign nodules. Clinical results

Volume changes in a 5-year follow-up in 77 patients

Mean Delta Volume %

<table>
<thead>
<tr>
<th>Time</th>
<th>Volume %</th>
</tr>
</thead>
<tbody>
<tr>
<td>To</td>
<td>0</td>
</tr>
<tr>
<td>1 day</td>
<td>-60</td>
</tr>
<tr>
<td>1 week</td>
<td>-50</td>
</tr>
<tr>
<td>1 month</td>
<td>-40</td>
</tr>
<tr>
<td>6 months</td>
<td>-30</td>
</tr>
<tr>
<td>1 year</td>
<td>-20</td>
</tr>
<tr>
<td>2 years</td>
<td>-10</td>
</tr>
<tr>
<td>3 years</td>
<td>0</td>
</tr>
<tr>
<td>5 years</td>
<td>10</td>
</tr>
</tbody>
</table>
LA: Compact Nodule
Before and After 5 Years

-38% ΔVolume
LA: Spongiform Nodule
Before and After 5 Years

-71% ΔVolume
US Structure & Volume Change after 5 Years in 77 Patients

Time 0   6 Months   1 Year   3 Years   5 Years

% Mean Delta Volume

-80 -60 -40 -20 0 20 40

Compact
Spongiform
Indications for LA Therapy in Benign Thyroid Nodules

- Benign thyroid nodules are effectively reduced by LA
- The mean volume reduction after 5 years is about 50%
- Spongiform nodules after 5 years are best reduced (–68%) than compact nodules (-27%) P<0.0023
Interstitial Tissue Laser Ablation (LA) in primary micro-PTC
LASER IN PRIMARY MICRO PTC

A Feasibility Study on 3 Cases

Roberto Valcavi, MD FACE
IRCCS Santa Maria Nuova
Reggio Emilia Italy
Objective of the study: evaluate the feasibility of LA on thyroid PMC as a primary treatment and to prove histologically the tumor destruction

Methods: Ethical Committee Approved. Three volunteers with a single PMC smaller than 10 mm diagnosis at fine needle aspiration cytology (FNAC) underwent percutaneous ultrasound-assisted LA of the PMC in the operating room under general anesthesia

Total energy delivery was 1,800 Joules

The surgeon directly started a standard total thyroidectomy

Results: Tumor destruction was demonstrated by loss of TTF1 and anti-mitochondria antibody expression in the whole ablated area and in the rim of normal tissue surrounding the tumor
Laser in primary PMC: Histology
<table>
<thead>
<tr>
<th>Patient No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AGE</strong></td>
<td></td>
<td>42</td>
<td>55</td>
</tr>
<tr>
<td><strong>MORPHOLOGIC FEATURES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tumor Diameter mm</td>
<td>9</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Multifocality</td>
<td>Absent</td>
<td></td>
<td>3 foci, 1 mm each, all in the right lobe</td>
</tr>
<tr>
<td>Vascular Invasion</td>
<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>Lymph-node Metastases</td>
<td>Absent</td>
<td></td>
<td>Present 1/3 lymph nodes resected</td>
</tr>
<tr>
<td><strong>BRAFV600E MUTATION</strong></td>
<td></td>
<td>Present</td>
<td>Present</td>
</tr>
</tbody>
</table>
Conclusions

- Percutaneous LA is technically feasible for complete PMC destruction.
- Tumor multi-focality and micrometastasis cannot be recognized preoperatively with ultrasound or molecular biological markers.
- LA may be useful in selected patients with PMC (poor surgical risk, surgical treatment refusal).
- LA may become a primary choice treatment for PMC if future new knowledge would permit preoperative detection of multifocality and lymph node metastasis.
Thyroid Ablation Team
Robert Valcavi, MD, FACE, Director
Angelo Bertani, MD
Giorgio Stecconi Bortolani, MD
Matteo Ricco, MD Statistician
Monica Frattini SN
Donato Nicolò, SN
## LA 5-Year follow-up study

### Patients and Methods

- **Pts with 5 yrs follow-up**: 77 (M 17, F 60)
- **Age**: 52.2 ± 12.3 years
- **Citology**: benign hyperplasia
- **No. of optic fibers**: 1-4 (2.4 ± 0.6)
- **Energy delivered**: 8,522 ± 5,365 J (1,200–32,000 J)
- **Output power**: 2-4 Watts (3.1 ± 0.5 W)
- **Treatment time**: 19 ± 8 min
- **Pre-treatment volume**: 23.1 ± 21.3 ml (2.6-86.4 ml)