Osteoid osteoma: Cryoablation

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Disclosure

Speaker name: Kristina I. Ringe

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): Bayer Healthcare (advisory board), Imactis (advisory board), Varian (honorarium)

☐ I do not have any potential conflict of interest
Cryoablation of OO

- osteoid osteoma
  - clinical aspects
  - treatment

- cryoablation
  - technique
  - evidence

Hong K, Georgiades CS. In: Percutaneous Tumor Ablation, 2011
Osteoid osteoma (OO)

- benign bone tumor (10% of all benign bone lesions)
- peak 10-25 yo; m > f (~4:1)

**Histology:** central nidus (osteoblasts, osteoid; peripheral nerval and vascular supply)

- excessive production of prostaglandins
  - local inflammation
  - hyperemia
  - abnormal bone growth

Symptoms: (nocturnal) pain, responsive to NSAIDs

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Motamedi et al. Radiographics 2009;29:2127-2124

Jaffé. Arch Surg 1935;31:709-728


Kransdorf et al. Radiographics 1991;11:673-696
Clinical symptoms & imaging findings are pathognomonic for diagnosis!

10yo male, nocturnal pain in left thigh

Ringe KI et al. Röfo 2016;188:539-550
OO – Treatment options

• medical / conservative:
  - slow growth tendency
  - side effects (long term medication)

• interventional treatment (ablation) → treatment of choice
  - RFA, laser, cryoablation, MWA
  - complete destruction of nidus

• surgical (en-bloc rx, curettage)
  - invasive
  - difficult localization of nidus
  - complication rate up to 45.5%

Cantwell et al. Eur Radiol 2004;14:607-617

37yo female; OO in humerus:
**OO – Cryoablation**

**Clinical presentation:** 15yo female; nocturnal pain (~6 months) right lower leg, responsive to NSAIDs

**Discussion in MDT:**
→ referral for ablation
15yo female, OO right lower limb: cryoablation (CT-guidance; GA, supine position)

**Preparation:**
- positioning
- Image acquisition
- localization
15yo female, OO right lower limb: cryoablation (CT-guidance; GA, supine position)

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**Targeting:**
- bone access
- single slice control scans
- (co-axial) placement of probe

Department of Diagnostic and Interventional Radiology
15yo female, OO right lower limb: cryoablation (CT-guidance; GA, supine position)

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**Cryoablation:**
- cycles (10min freeze, 5min thaw; 45-80% gas flow rate)
- intermittent monitoring
- skin protection
15yo female, OO right lower limb: cryoablation (CT-guidance; GA, supine position)

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Cryoablation:
- cycles (10min freeze, 5min thaw; 45-80% gas flow rate)
- intermittent monitoring
- skin protection

Control:
- complete ablation (3 planes !)
- no complications
- admittance overnight

Clinical follow-up:
• 6 weeks: free of pain
• 5y: free of recurrence
**OO - probe placement (nidus destruction)**

**RFA:** bone inhibits conduction of heat
→ penetration of bone necessary!

**cryo:** ice ball can penetrate cortex
→ adjacent probe placement possible!

17yo male, osteoid osteoma talus

18yo male, osteoid osteoma tibia

Le Coroller T et al. Radiology 2022;302:392-9
<table>
<thead>
<tr>
<th>Study type</th>
<th>Patients</th>
<th>Complications*</th>
<th>Outcome / Conclusion</th>
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<tbody>
<tr>
<td>Liu et al. JVIR 2010</td>
<td>case rep.</td>
<td>2</td>
<td>primary success rate 100% (F/U 20.5 months)</td>
</tr>
<tr>
<td>Wu et al. Skeletal Radiol 2011</td>
<td>retrospective</td>
<td>6</td>
<td>primary success rate 100% (F/U 28.7 months)</td>
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<tr>
<td>Coupal et al. AJR 2014</td>
<td>retrospective</td>
<td>10</td>
<td>clinical &amp; technical success rate 100% (F/U 23 weeks)</td>
</tr>
<tr>
<td>Whitmore et al 2016</td>
<td>retrospective</td>
<td>29 (&lt;18 y/o)</td>
<td>6 minor                                                                             technical success 100%; clinical success 96.4%</td>
</tr>
<tr>
<td>Miyazaki et al 2018</td>
<td>prospective</td>
<td>9</td>
<td>technical efficacy 100%</td>
</tr>
<tr>
<td>Shah et al. Pediatr Radiol 2019</td>
<td>retrospective</td>
<td>63 (&lt;18 y/o)</td>
<td>2 minor                                                                             primary success rate 96.8% (F/U &gt; months)</td>
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<tr>
<td>Meng et al 2021</td>
<td>retrospective</td>
<td>15 (cryo)</td>
<td>minor: 6 vs 13 major: 9 vs 3                                                          cryo: technical success 100%; shorter hospitalization time, less complications</td>
</tr>
<tr>
<td>Le Corroller et al. Radiology 2022</td>
<td>retrospective</td>
<td>50</td>
<td>3 minor                                                                             primary clinical success rate 96%</td>
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*post procedural pain, mild soft tissue reactions
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<tr>
<td>Lindquester et al 2020</td>
<td>n=1798</td>
<td>- Overall success rate 91.9%</td>
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<td></td>
<td>- Overall complication rate 2.5%</td>
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<td></td>
<td>comparison of RFA, (MWA) &amp; cryo</td>
<td>RFA vs cryo:</td>
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<tr>
<td></td>
<td></td>
<td>- Similar efficacy</td>
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<tr>
<td>Shanmugasundaram et al 2021</td>
<td>n=1528</td>
<td>- technical and clinical success rates similar</td>
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<tr>
<td></td>
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<td>- no major complications</td>
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<td>comparison of RFA, laser and cryo</td>
<td>- overall recurrence 4% (average 11 months)</td>
</tr>
</tbody>
</table>
Cryoablation of OO

• safe and effective treatment (comparable to RFA)

(Theoretical) Advantages:
• less pain (intrinsic analgesic effect)
• good controllability (visualization of the “ice ball”)
• penetration of bone not mandatory (in certain cases)

• long-term evidence limited
• no comparative large prospective studies