Pediatric Cancer: Cryoablative Palliation of Painful Musculoskeletal Metastases

Christopher A Hesh MD, C Matthew Hawkins MD, Anne E Gill MD

Department of Radiology & Imaging Sciences, Division of Interventional Radiology & Image-Guided Medicine

Disclosures

Christopher Hesh, MD: None

C Matthew Hawkins, MD: None

Anne E Gill, MD: None

Overview

1. Cancer Induced Bone Pain
2. Current Methods of Palliation
3. Role of Cryoablation in Palliation
4. CHOA Experience

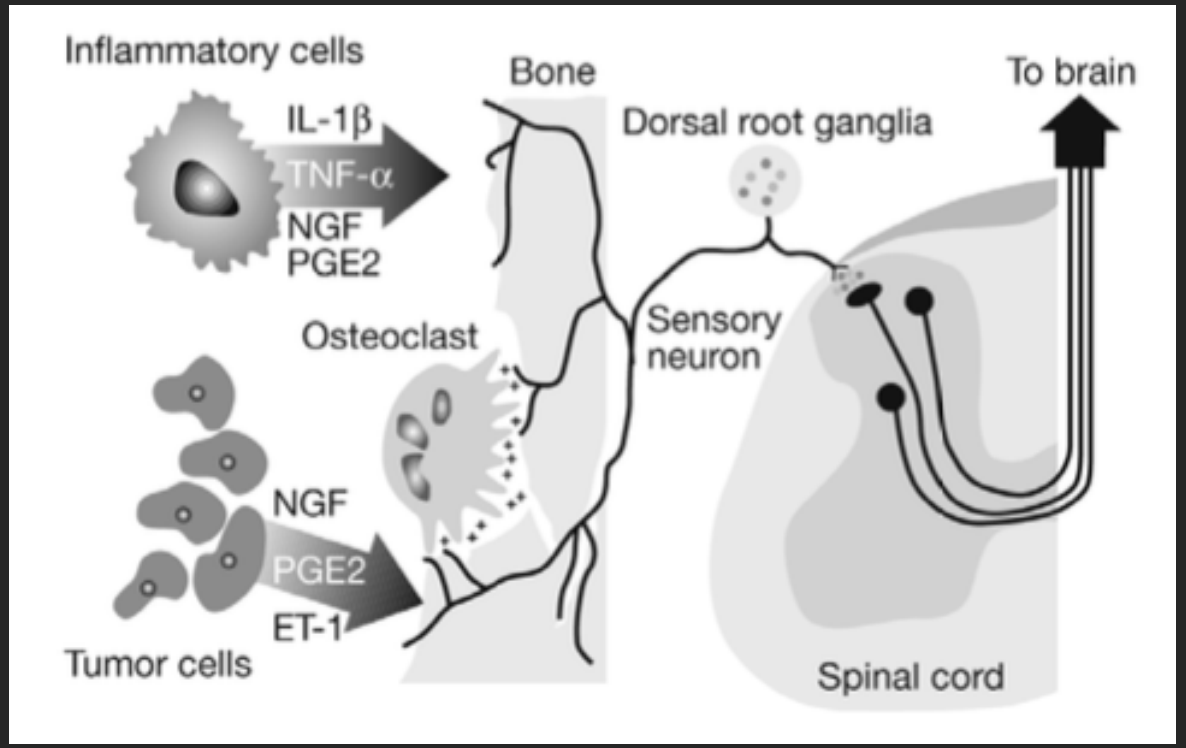
Cancer induced bone pain (CIBP)

Presentation

- Background pain
- Spontaneous pain
- Movement-induced pain

Impact

- ↑ Morbidity + Anxiety
- ↓ Performance status
- ↓ Quality of life



Mantyh 2006

Mercadante 1997, Urch 2004

CIBP Workup

Past care

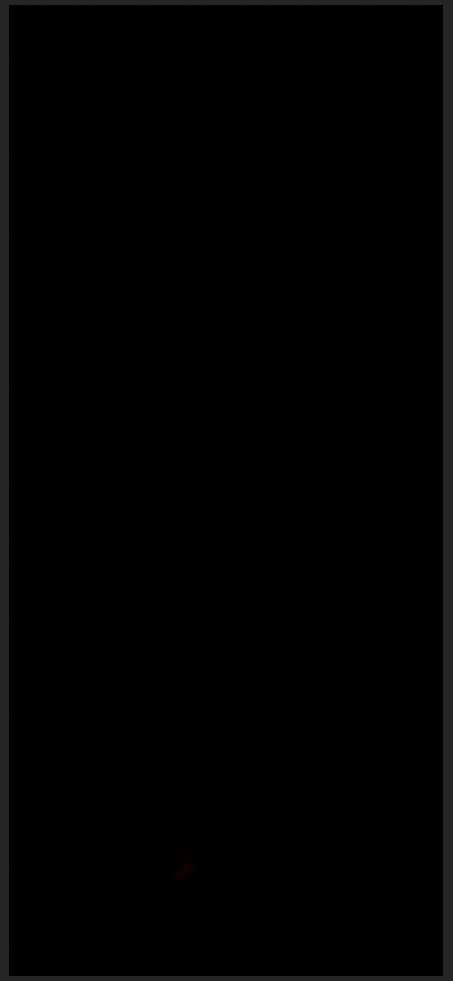
- Anatomy-altering interventions

Goals of care

- Function
- Pain relief

Imaging

- CT or PET/CT
- MRI



PET/CT of patient with Ewing Sarcoma metastasis to right femur

Pain Palliation: Current Treatment Options

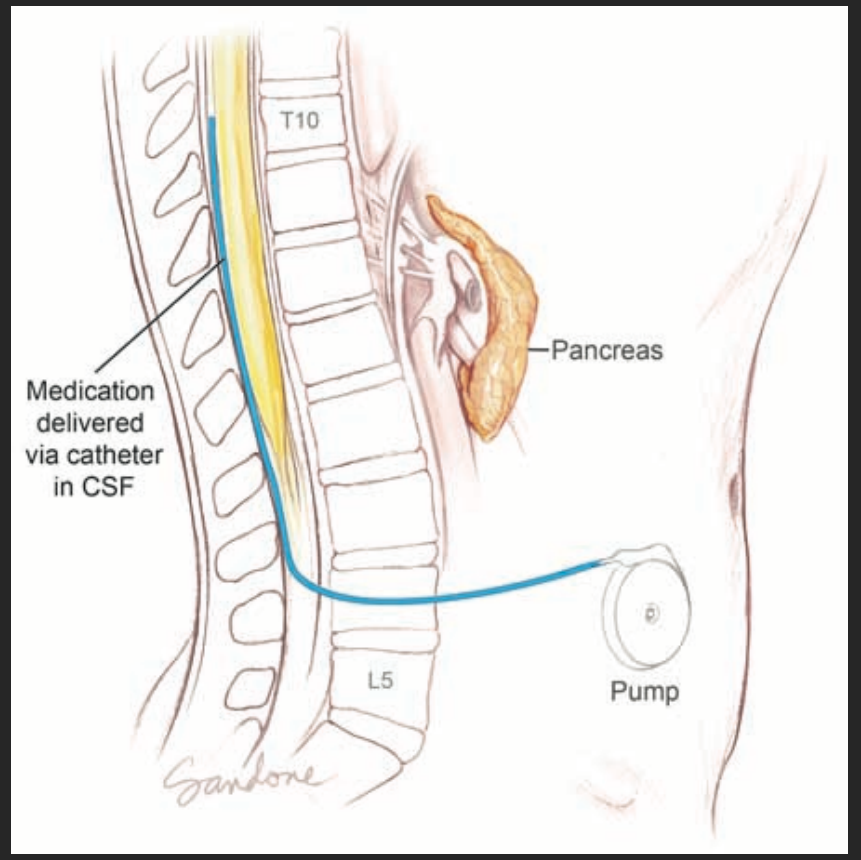
Systemic analgesics

- Nociceptive pain (Nonopioids -> Opioids)
- Neuropathic pain (Adjuvant)

External Beam Radiation

Anesthesia

- Intrathecal pumps
- Epidural injections
- Peripheral nerve blocks



The Sol Goldman Pancreatic Cancer Research Center

Urch 2004; Anghelescu 2019

Cryoablation for pain

Mechanism of action

- Tumor necrosis + local control
- Periosteal nerve ablation

Timeline of pain relief: 1 day – 6 months

Callstrom 2013; Wallace 2016; Prologo 2014

Cryoablation for pain

Cryoablation vs other thermal ablation

- Better visualization
- Less procedural pain

Complications (2-11%)

- Skin injury
- Transient nerve injury

Callstrom 2013; Prologo 2014; Wallace 2016

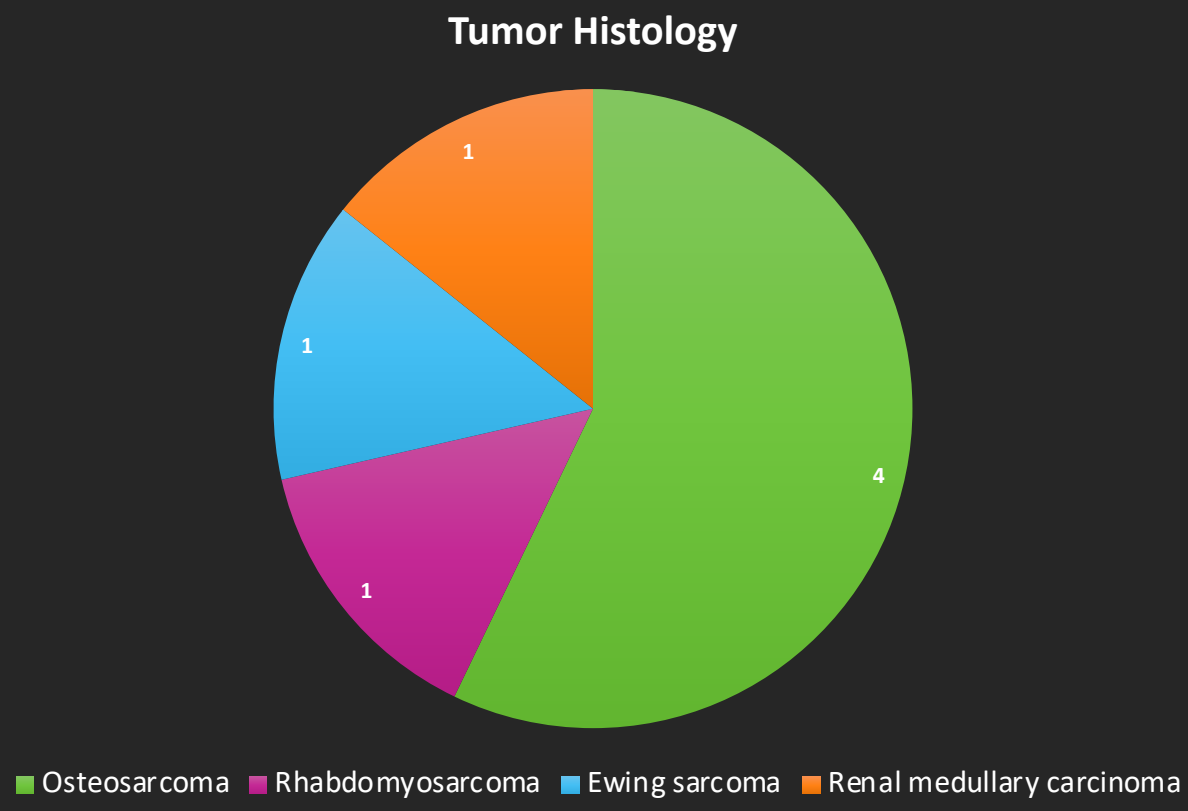
CHOA Experience

Inclusion Criteria:

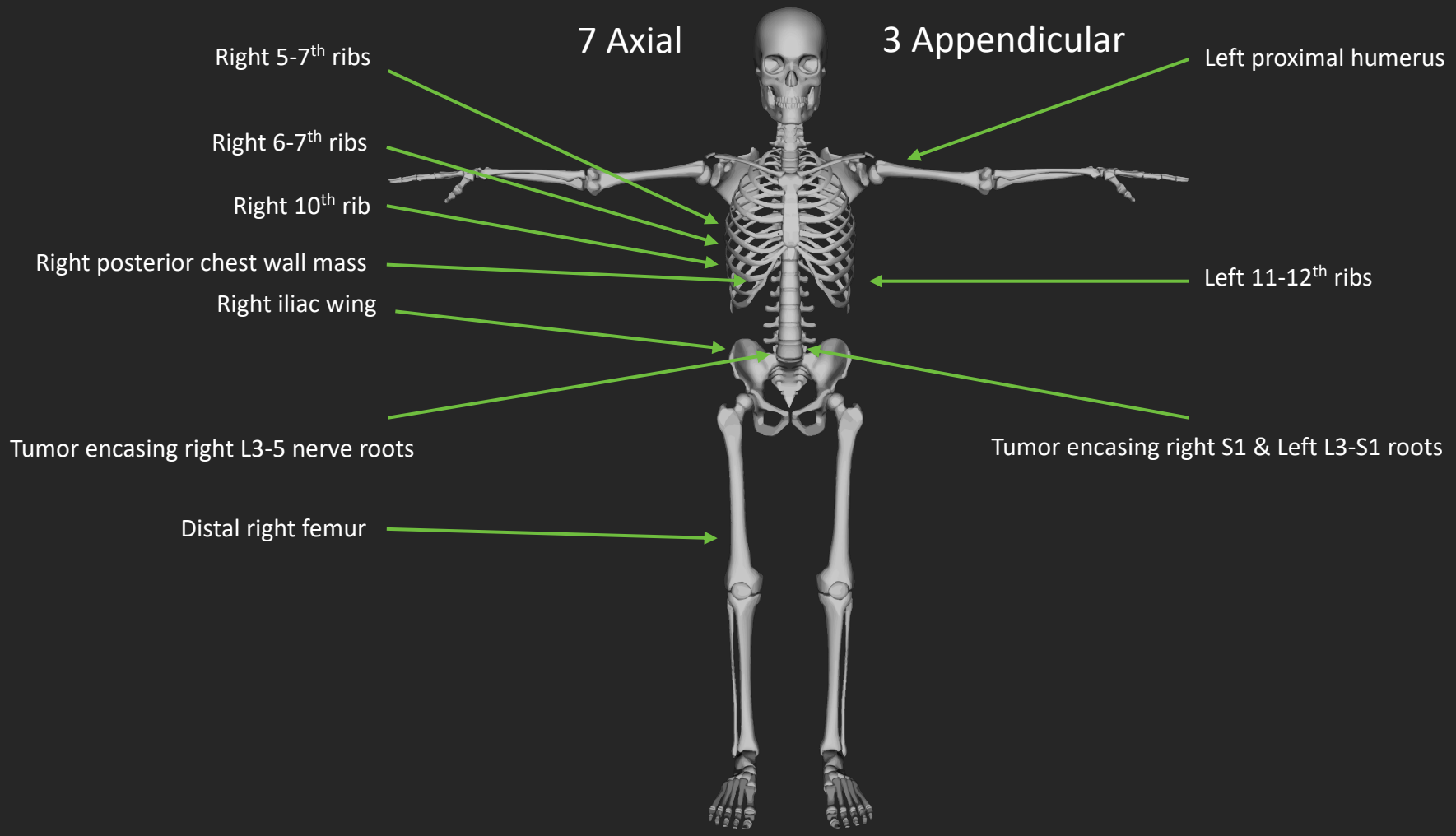
- Pediatric solid tumor histology metastatic to MSK
- January 2015 - June 2019

Patients

- 7 patients
- 10 treatments
- Mean age 18 y (Range 14-26 y)



Lesions Treated



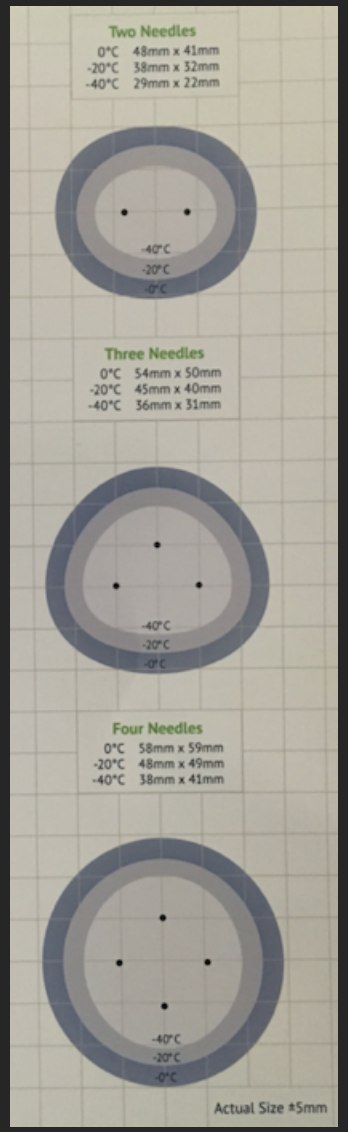
Technical Considerations

Cryoprobes

- Average number of probes placed to cover lesion: **4** (Range 3-6)
- BTG
  - IceForce (18)
  - IceRod (11) / CX (4)
  - IceEdge (3)
  - IceSphere (2)
  - IcePearl (3)
- Imaging assistance
  - Cone-beam CT (100%)
  - Ultrasound (50%)

Freeze/thaw cycle

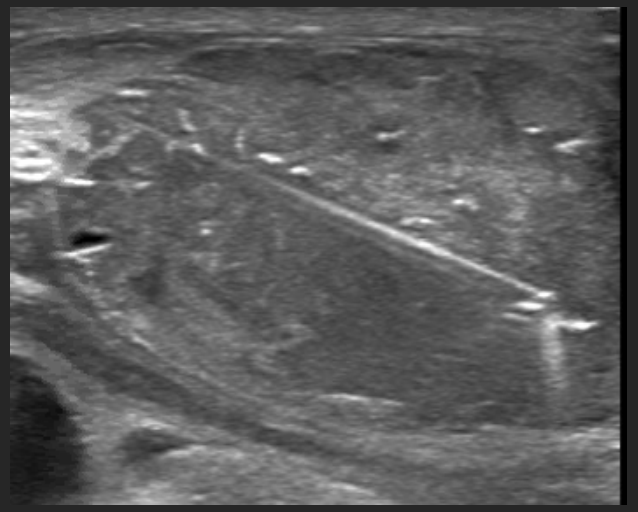
- (9) 2 x 10 min freeze / 2 x 5 m thaw
- (1) 2 x 8 min freeze / 1 x 4 m + 1 x 3 m thaw



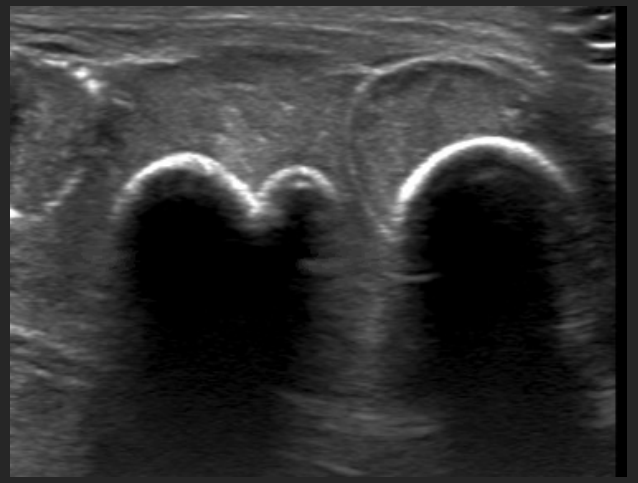
IceSphere multiprobe map

Case

Rhabdomyosarcoma rib metastasis

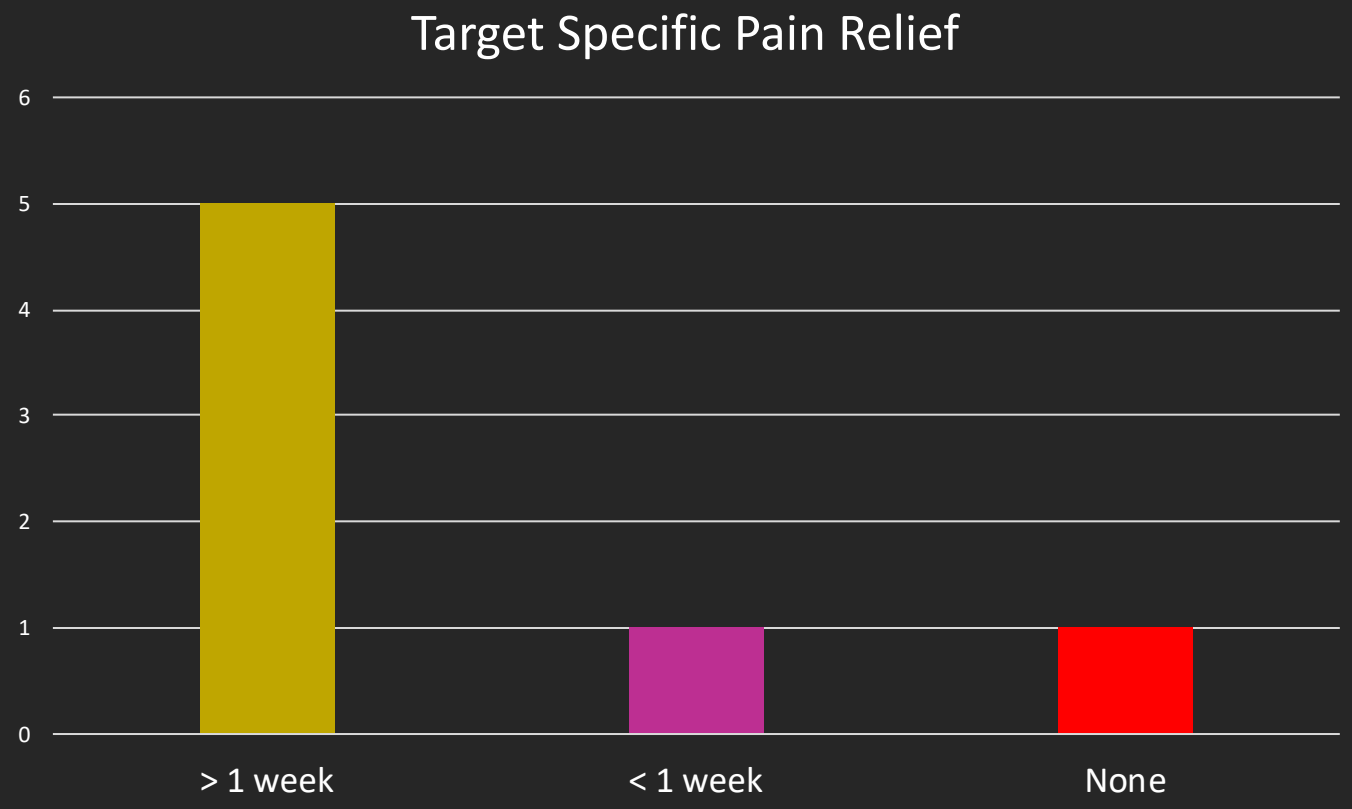


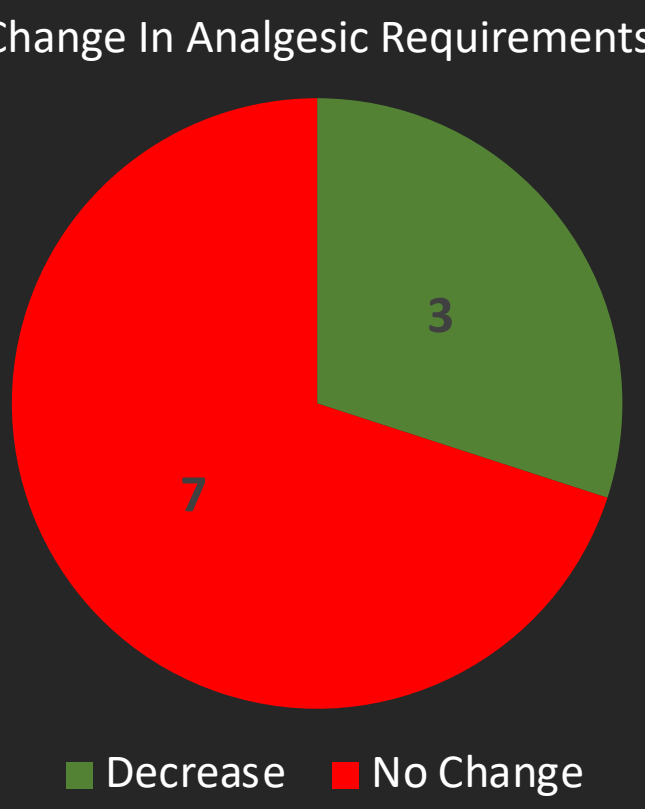
First probe placement



Ice ball on ultrasound

Palliation





Average time from ablation to death: **4 months**

Limitations

Retrospective case series

- Limited reliability of pain scales
- Poor long-term follow-up of site-specific pain

Analgesic pain regimen changes confounded by other sites of pain

Conclusion

Cryoablation is a potentially ideal option for palliation of pediatric MSK metastases.

Future

- Standardization of pain evaluation
- Identification of tumor histologies and metastatic locations most responsive

References

Anghelescu DL, Pankayatselvan V, Nguyen R et al. Bisphosphonate Use in Pediatric Oncology for Pain Management. Am J Hosp Palliat Care. 2019; 36: 138-142.

Callstrom MR, Dupuy DE, Solomon SB et al. Percutaneous image-guided cryoablation of painful metastases involving bone: multicenter trial. Cancer. 2013; 119: 1033-1041.

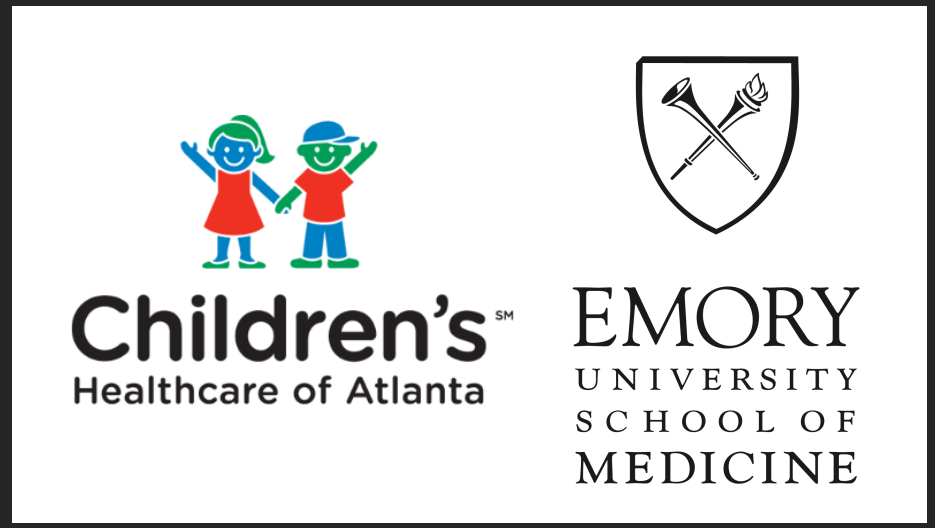
Mantyh P. The science behind metastatic bone pain. European Journal of Cancer Supplements. 2006; 4: 4-8.

Mercadante S. Malignant bone pain: pathophysiology and treatment. Pain. 1997; 69: 1-18.

Prologo JD, Passalacqua M, Patel I, Bohnert N, Corn DJ. Image-guided cryoablation for the treatment of painful musculoskeletal metastatic disease: a single-center experience. Skeletal Radiol. 2014; 43: 1551-1559.

Urch C. The pathophysiology of cancer-induced bone pain: current understanding. Palliat Med. 2004; 18: 267-274.

Wallace AN, McWilliams SR, Connolly SE et al. Percutaneous Image-Guided Cryoablation of Musculoskeletal Metastases: Pain Palliation and Local Tumor Control. J Vasc Interv Radiol. 2016; 27: 1788-1796.


Children's℠
Healthcare of Atlanta
EMORY
UNIVERSITY
SCHOOL OF
MEDICINE