



Management of Chronic Post-Mastectomy Pain Syndrome Through Repeated Ultrasound-Guided Percutaneous Intercostal Cryoneurolysis

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INTRODUCTION

- Post mastectomy pain occurs in approximately 30% of mastectomy patients¹
- Persistent post-mastectomy pain is associated with impairments of mood, cognition, sleep, activities of daily living, social interactions, body image, and sexuality²
- Treatment options: medication, fat grafting, nerve block, radiofrequency ablation, peripheral nerve surgery, cryoneurolysis, and botulinum toxin injection¹

MATERIALS AND METHODS

1. Patient placed in prone position; skin prepared with chlorhexidine & draped at T2-T5
2. T2-T5 intercostal space (lateral to paravertebral space) ID'd with ultrasound
3. Skin topicalized at T5 with 1% lido; 14g 2" angiocath inserted under ultrasound guidance
4. 16g 5" trocar cryoprobe inserted thru 14g cath inferior to T5 rib to neurovascular bundle
5. Cryoprobe activated to -70°C with N₂O for 2 mins then 30 sec thaw period
6. Repeat freeze to -70°C for a total of 2 freeze/thaw cycles
7. Cryoprobe repositioned to T4→T3→T2 intercostal nerves under ultrasound guidance and freeze steps 5&6 were repeated at each intercostal space
8. Cryoprobe & 14g catheter removed and sterile bandages applied
9. Similar approach was performed for three subsequent treatments



Image 1



Image 2



Image 3

Image 1, 2, & 3: The cryoneurolysis device reaches sub-zero temperatures through the Joule-Thomson effect, where pressurized N₂O travels through a microscopic annulus into a lower pressure chamber at the tip. Gas expansion in the lower-pressure chamber causes the temperature to drop to -70 °C and creates an external ice ball.

CASE REPORT

HPI: 68yo woman with chronic cervical radiculopathy and breast cancer s/p right mastectomy and radiation (10 years prior). Pain was “pressure, nagging and crushing” throughout axilla and anterior chest wall from the T2 to T5 dermatomes

PMH: Post-mastectomy pain syndrome, cervical neck pain, breast cancer

Meds: morphine ER 20mg twice daily, oxycodone IR 5mg as needed every 4 hours, pregabalin 300mg daily

Initial treatment: Right ultrasound-guided T5 paravertebral block with bupivacaine 0.25% (20mL) and dexamethasone (5mg) every 1-2 months. Repeated four times. Relief typically ranged from 2-6 weeks.

Cryoneurolysis: After paravertebral block became ineffective, cryoneurolysis was offered. Ultrasound-guided intercostal cryoneurolysis was performed as described above. Patient reported complete analgesia lasting 4 months and then a gradual return to baseline after 2 months. Cryoneurolysis was repeated 7 months after initial treatment, and similar analgesia duration was reported. This was then repeated a third time 7 months after her second treatment. Similarly, a fourth treatment was provided 8 months after her third treatment.

Follow up: Overall, patient reported satisfaction with her analgesia, vast improvement in her quality of life, and had not experienced any neurologic sequelae. She reported a decrease in her total opioid requirement during this 2.5-year period, however, she was unable to wean off all her opioids due to other co-existing chronic pain conditions (chronic cervical radiculopathy).

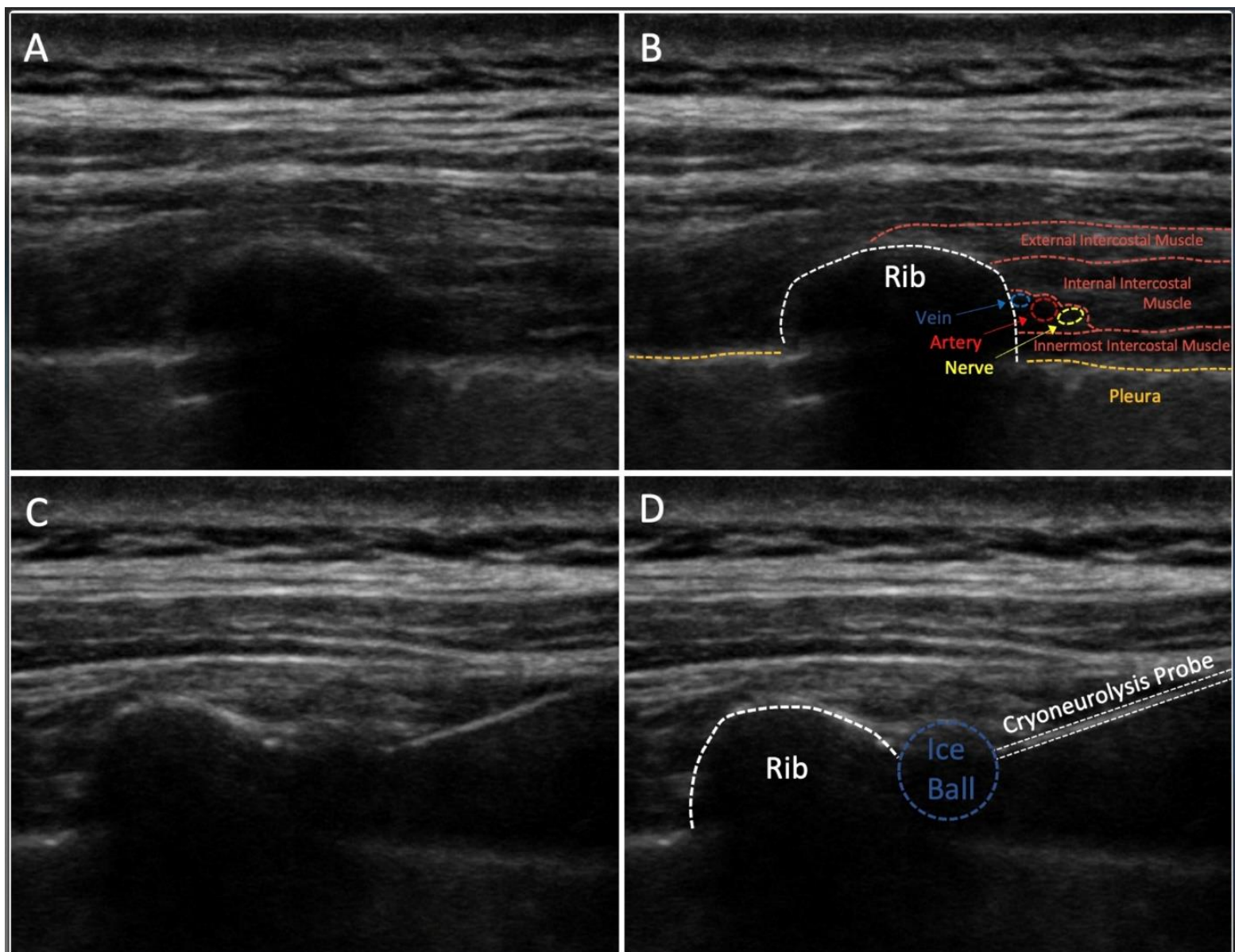


Figure 1: A: Ultrasound image of rib B: Labeled image C: Cryoneurolysis probe with ice ball forming at inferior aspect of rib D: Labeled image of cryoneurolysis probe with ice ball. Dr. Finneran approved re-use of this figure.

DISCUSSION

This case describes a positive outcome for a patient with chronic post-mastectomy pain syndrome who received four treatments of intercostal cryoneurolysis over 2.5 years. She had chronic pain for approximately 10 years prior to her initial visit. The patient was initially treated with frequent paravertebral blocks but this did not provide lasting effects. Eventually, she underwent ultrasound-guided cryoneurolysis, which provided adequate analgesia for up to 6 months each time. She underwent repeat treatments without any long term neurological sequelae. Overall, these treatments have improved her quality of life.

The mechanism of cryoneurolysis is related to the resulting second-degree injury to the peripheral nerve, which leads to Wallerian degeneration. Reversible degeneration of the axon occurs when the peripheral nerve is exposed to temperatures between -20°C and -88°C. This degeneration begins at the site of treatment and proceeds distally. As only the myelin sheath is destroyed, axonal regeneration occurs with the eventual reinnervation of the nerve.³ Of note, at temperatures warmer than -100°C, the endoneurium, perineurium, and epineurium remain intact. Given the intentional nerve injury provided by this treatment, there are potential concerns with long term neurological sequelae, such as an increase in longer-term neuropathic-like pain. However, overall, large scale studies have been overwhelmingly positive.⁴ Clinical studies that demonstrated subsequent long-term neuropathic pain included those in which cryoneurolysis was applied surgically involving nerve retraction.⁴ Thus, it appears that less invasive approaches to cryoneurolysis (e.g. ultrasound-guided percutaneous) may be safer. Furthermore, our case report suggests that repeated treatments may also be safe, however further large-scale studies are needed to make this claim.

REFERENCES

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