

Introduction

- **Cryoneurolysis** is the application of **cold temperatures to ablate nerve tissue**, oftentimes to provide pain relief.^{1,2}
- **Otagia** is ear pain that can be categorized as primary, occurring within the ear itself, or secondary, referred pain from another source such as **auriculotemporal neuralgia**.³
- Literature on the use of cryoneurolysis for otagia is limited, however, **cryoneurolysis has been successfully used to treat occipital neuralgia**.⁴

Case Description

An **Army veteran male in his 40s** with history of **mild traumatic brain injury** from a 2007 mortar attack presented with **persistent right-sided otagia**, imbalance, vertigo, and chronic migraine. Otagia began after the injury in 2007 and persisted despite surgical repair of a right ear fistula. His otagia pain was 5-6/10 at baseline, worsening with activity or sinus infections.

- MRI IAC (2016) and MRI Brain (2022) were without acute findings.
- In 2023, ENT evaluation suggested migraine-related otagia.
- Multiple medications and procedures were trialed for treatment:

Medication Trials		Procedure Trials
➤ Topiramate	➤ Sumatriptan	Botulinum toxin injections (PREEMPT Protocol) Right auriculotemporal nerve blocks x4 (with 1% lidocaine and 0.5% bupivacaine)
➤ Gabapentin	➤ Rimegepant	
➤ Propranolol	➤ Ubrogepant	
➤ Amitriptyline		

- **Ubrogepant** and **botulinum toxin injections** were effective **for migraine only**, but right-sided otagia did not improve
- **Right auriculotemporal nerve blocks resolved otagia**, but effects only lasted for a week each time
- Two months after last auriculotemporal nerve block, patient underwent **cryoneurolysis of the right auriculotemporal nerve**:
 - Ultrasound was used to localize branches of the right auriculotemporal nerve and avoid vasculature
 - 1cc of 1% lidocaine used for local anesthetic
 - Two sites were injected with liquid nitrogen, using the lovera system and trident probe
- At follow-up, patient reported **complete resolution of otagia**, however he also noted increased right ear pressure and worsened tinnitus, as well as increased dizziness

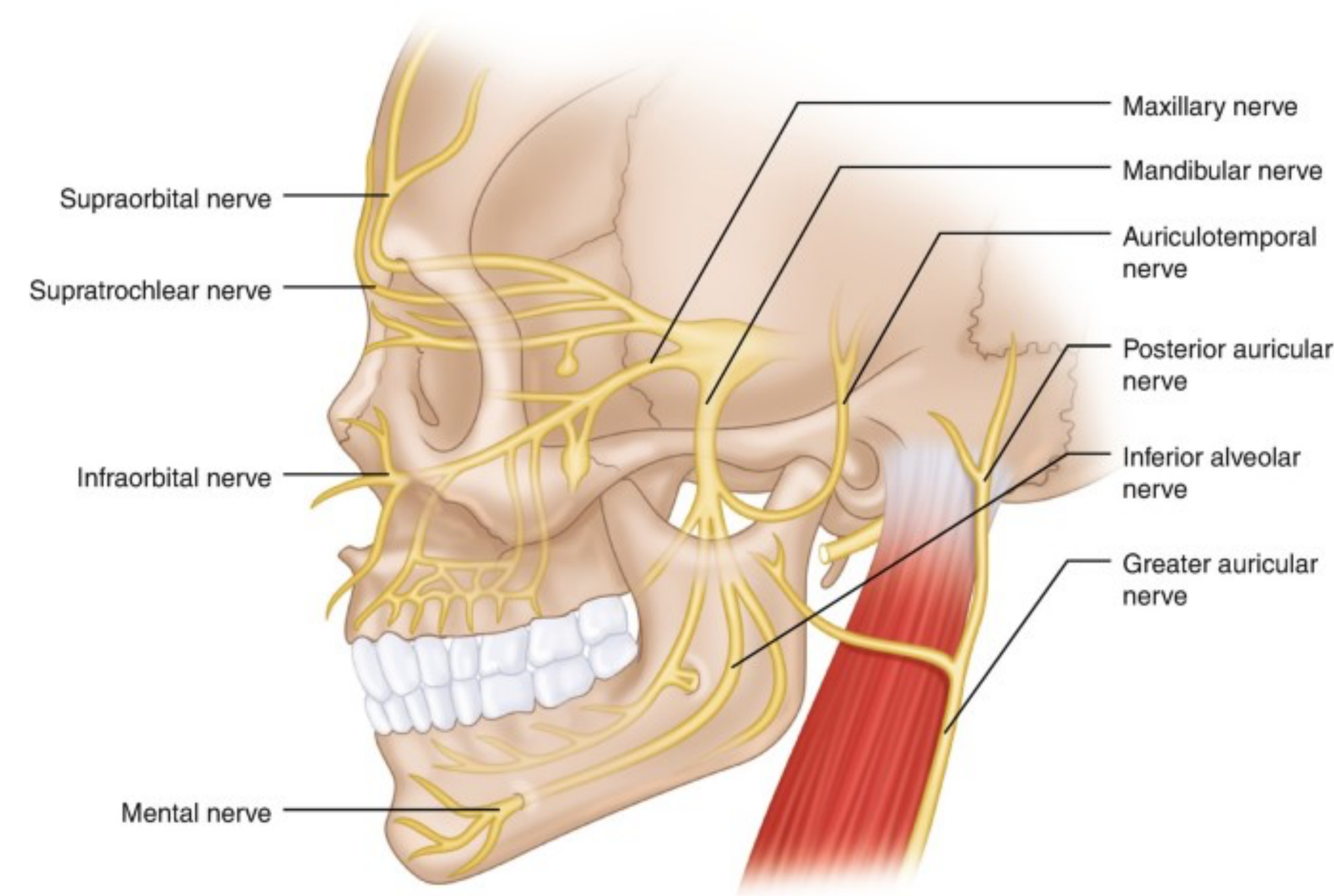


Figure 1: Anatomy of the peripheral nerves of the skull.

The auriculotemporal nerve (ATN) surfaces onto the face from behind the temporomandibular joint (TMJ) within the superior surface of the parotid gland. It ascends close to the superficial temporal artery, passes over the posterior portion of the zygoma, and divides into superficial temporal branches. The cutaneous branches of the ATN supply the tragus and part of the adjacent auricle of the ear and the posterior part of the temple. The ATN also provides sensory innervation to the majority of the TMJ exits.⁵

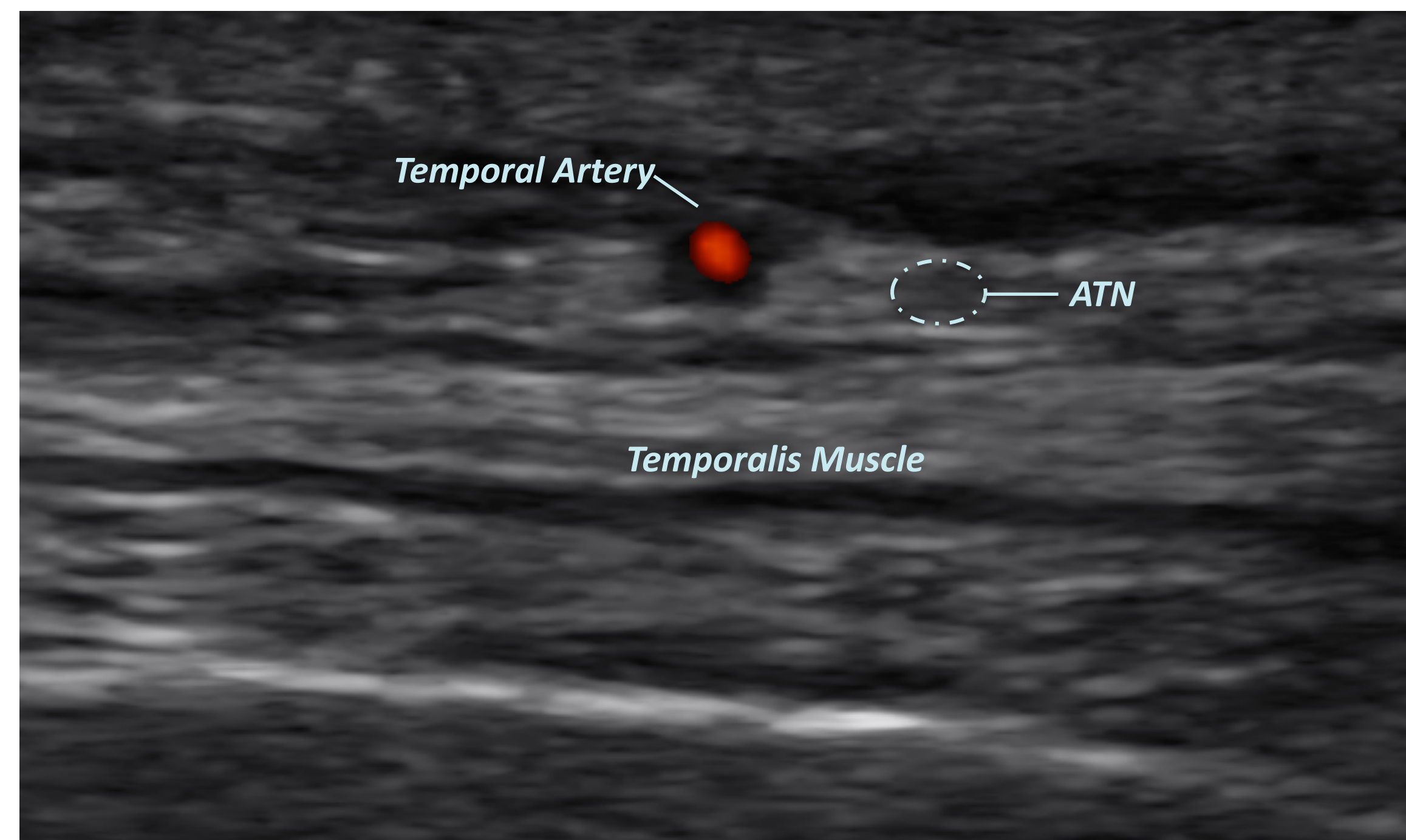


Figure 2: Ultrasound of the Auriculotemporal Nerve & Temporal Artery

Discussion

- Studies and case reports have shown that cryoneurolysis has been effective for acute pain control in postoperative thoracotomy, mastectomy, total knee arthroplasty, and shoulder arthroplasty pain and chronic pain control in occipital neuralgia, temporomandibular disorders, osteoarthritis, phantom limb, and neuropathic pain conditions.^{1,4}
- Traditional anesthetic nerve blocks provide pain relief; however, the effects are usually short-lived.
- **Cryoneurolysis induces Wallerian Degeneration** distal to the treatment site.²
- **Slow axonal regeneration** occurs, around a rate of **1-2 mm day**, until conduction is restored.²

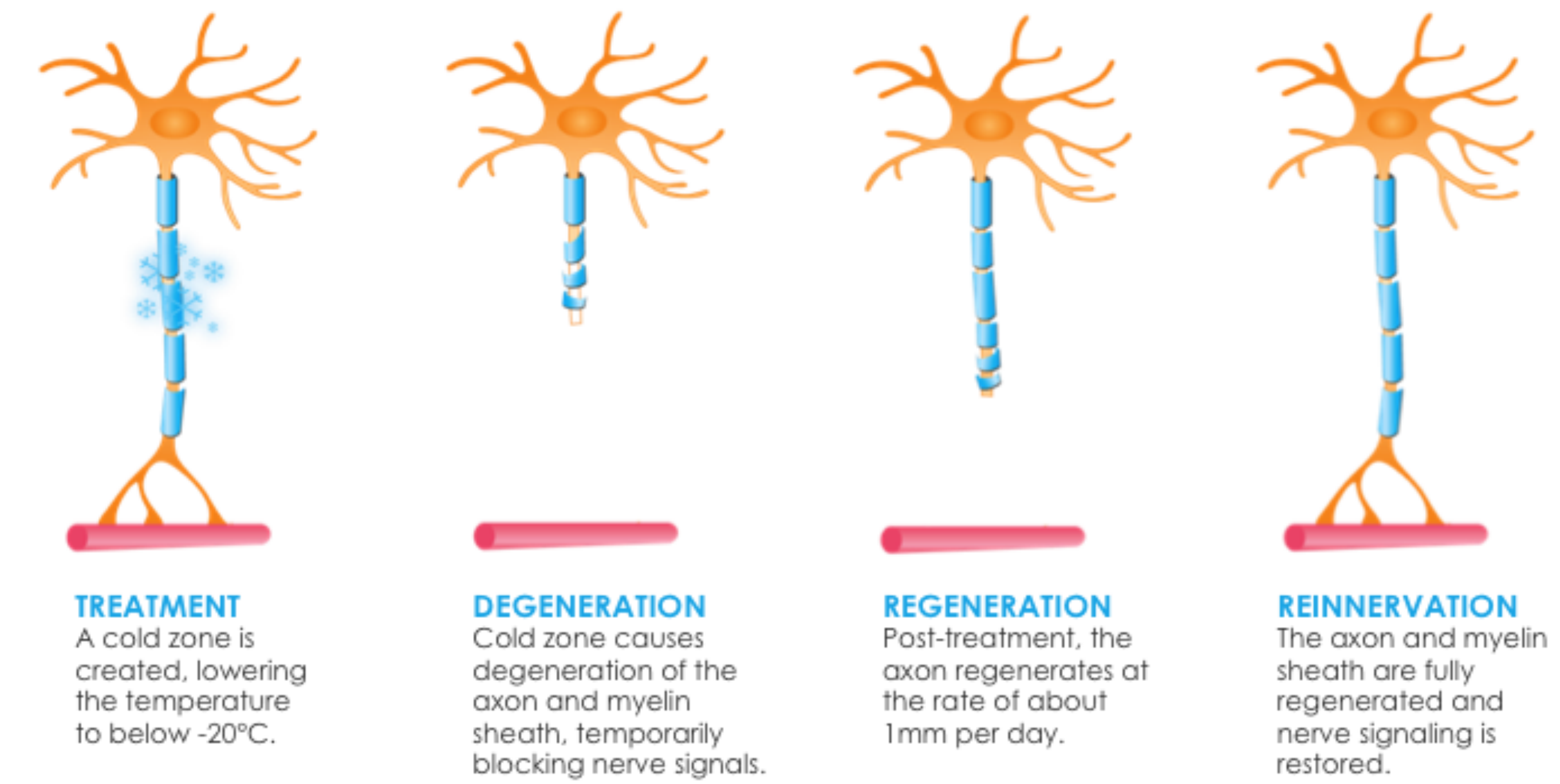


Figure 3: Wallerian degeneration induced by cryoneurolysis

Precise cold zone targeting causes axonal and myelin sheath degeneration distal to freeze site, achieving a temporary nerve block. Slow regeneration occurs until nerve signaling is restored.⁶

Conclusion

- This patient had two months of pain relief after undergoing cryoneurolysis.
 - Despite unexpected effects of increases right ear pressure and worsened tinnitus, as well as increased dizziness, he elected to repeat the procedure given the significant pain relief he experienced
- **Cryoneurolysis provides similar pain relief to traditional anesthetic nerve blocks but for prolonged duration.**
- Although repeat cryoneurolysis procedures may be needed in the future, these will not be as frequent as the peripheral nerve blocks.

References

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