**Cryoanalgesia and Cryolysis**

**Introduction:**
Modern cryoneurolysis is based upon controlled cooling via the expansion of highly pressurized and compressed gas (nitrous oxide or carbon dioxide) through a narrow slit aperture. Gas under high pressure (650–800 psig) passes between the two tubes and is released through a small orifice into the chamber of the tip of the probe. Compressed gas expands as it passes through the orifice, resulting in a rapid decrease in temperature at the probe tip (the Joule-Thomson effect). Absorption of heat from the surrounding tissues accompanies gas expansion and leads to the formation of an ice ball by freezing of intracellular and extracellular water. The rapid cooling at the tip results in temperatures of approximately -70°C. Ice balls vary in size as a function of probe size, freeze time, tissue permeability to water and the presence of vascular "heat sinks."

Modern insulated cryoprobes and cryotherapy units have the ability to discriminate stimulation of sensory and motor nerves. Locating the precise "pain generator" with nerve stimulation is necessary because of the size of the ice ball that is generated and the need to avoid freezing of other non-targeted tissues and nerves. Therefore, chronic painful conditions due to small localized lesions of peripheral nerves are usual indications for cryoneurolysis.

The potential for use of cryoneurolysis in chronic pain management is great. Most cryoneurolysis involves a percutaneous approach which means that accurate identification of pain generators and probe placement is necessary. As a modality, cryoneurolysis is "ideal" for the management of various chronic pain disorders given the cellular basis of cryoneurolysis. In comparison to other chemical or thermal techniques, the potential for neuroma formation or deafferentation pain is less or nonexistent. There is only one reported case of neuritis after cryoneurolysis. The neuritis occurred after an open cryoneurolysis of an intercostal nerve. It is entirely possible that the probe itself (rather than the freeze ball) could have damaged the nerve.

Prior to the performance of cryoneurolysis, pain generators must be clearly identified. Some authorities suggest a series of test blocks to determine if blocking the purported pain generators will alleviate the pain, thereby localizing and confirming the pain generator. Some authorities suggest utilization of a series of test injections (first block with lidocaine and the second with bupivacaine). Theoretically, a more prolonged analgesic response can be expected with bupivacaine in appropriate responders. In clinical practice, however, the analgesic response will often exceed the pharmacologic duration of the local anesthetic. The interpretation and explanation of this phenomenon is unclear.

**Applications:**
Cryoanalgesia can be utilized for treating small well localized lesions of nerves, for example neuromas and entrapment neuropathies. It can be used to treat perineal pain, lower extremity pain, and facial and cranial pain. It has also been used to obtain pain relief in bio-mechanical pain syndromes including lumbar or cervical facet syndromes and coccydynia. Other uses include: localized forms of myofascial pain, nerve entrapment syndromes, neuromas and localized peripheral neuropathy, phantom limb pain and joint/ligament pain such as the facet joint.

**Procedure:**
The patient is prepared under sterile conditions, and is kept awake in order to determine location of pain generator by palpation and/or stimulation. Sensory and motor stimulation are then performed to identify the pain generator. Acceptable sensory stimulation thresholds are less than 0.4 mV. Motor stimulation should be 1.5 times greater than the sensory threshold. Cryoneurolysis is then performed using 3-4 minute freeze cycles with 30 second thaw periods in between. During the thaw period, sensory stimulation should be performed to check the success of the initial freeze. Two or three additional freezes are then performed with 30 second thaw periods in between.

**Complications:**
Complications might include: failed treatment response, infection, numbness in the area of treatment, bleeding, increased pain or weakness.

Please note that we are requesting a tray fee of $100.00 to cover the costs of equipment, sterilization and staffing as the Medical Services Plan does not cover these services.

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