Abstract:

Cryosurgery is the selective exposure of tissues to extreme cold to bring about the destruction of diseased or abnormal cells. As a surgical modality it is often utilized in a variety of medical fields including dermatology and ophthalmology. Using cryobiology principles defined by clinical and tissue modeling studies the development of two distinct cryosurgical systems was completed. The first cryosurgical system was designed to provide the user with the accurate control of the three critical parameters of dermatologic cryosurgery; rate of freeze, duration of ice ball formation, and rate of tissue thaw. The design, based on the Joule-Thompson principle, provides accurate control of high-pressure nitrous oxide gas, and demonstrates two distinct advantages not currently available with the traditional liquid nitrogen systems. The first is a user defined temperature selection, which presents the clinical practitioner with an ability to select the optimal probe temperature for specific cases, and the second is the inclusion of predefined tissue thaw cycles that will provide increased tissue destruction over the currently used spontaneous thaw practice. A second cryosurgical system was designed and developed for use in ophthalmology. The system was developed as a possible new medical device for MIRA, Inc. (Uxbridge, MA) and was based on design parameters and market requirements provided by MIRA. The final design was prototyped and tested for device validity.