AbstractID: 2619 Title: Guided Radiation Therapy: Organ Motion Tracking with Implanted AC Electromagnetic Transponders

The Calypso® 4D Localization System (Calypso Medical, Seattle, WA) is an investigational device using AC electromagnetic fields to identify a radiation therapy treatment target with very small (1.8mm x 8.0 mm) implanted radiofrequency resonant circuits in or near the tumor site (Beacon® transponders) without adding ionizing radiation. The Calypso System enables accurate treatment setup and real-time monitoring of the target with an objective and simple user interface. This new localization approach in radiation therapy is expected to be a very efficient and accurate method for real-time radiation therapy setup and monitoring of the treatment target site.

Technical and clinical evaluations have been performed with regard to system accuracy and monitoring target motion. Early phantom investigations result in sub-millimeter precision measured at 8 cm from the electromagnetic array (σx = 0.006mm, σy = 0.01 mm , σz = 0.006mm) and at 27 cm from the electromagnetic array (σx = 0.27 mm, σy = 0.36 mm , σz = 0.48 mm). Measurements were essentially unchanged during a 20 second sampling period. The average measured target position varied less than 0.01 mm at 8 cm and less than 0.15mm at 27 cm.

Twenty patients were implanted with Beacon transponders to study implant stability and biocompatibility. A subset of the 20 patients were localized with the Calypso System and monitored over an eight minute period in the radiation therapy treatment room. Natural prostate motion was demonstrated and ranged from few millimeters of motion from the setup position to a shift from setup of > 1cm. The system has been designed for body wide localization and monitoring applications. Technical and clinical studies are underway to assess the application of AC electromagnetic tracking of organ motion in the prostate and other sites in the body. Anticipated clinical applications include real-time radiation therapy treatment setup and tracking for prostate, lung, head and neck, partial breast, liver and pancreatic tumor sites.

Educational Objectives:

1. Explore clinical application for use of AC electromagnetics for guiding radiation therapy setup and monitoring.
2. Review technical accuracy and precision of AC electromagnetic system for radiation therapy.

Author is an employee of Calypso Medical Technologies.