

AbstractID: 7310 Title: The effect of time on inter-transponder distance implanted in lung: An initial study in a canine model

Purpose: The Calypso 4D Localization® system uses non-ionizing AC electromagnetic technology to localize implanted Beacon® transponders. The system is capable of real-time measurement of internal motion. Effective use of this technology in the lung requires placing the transponders in fixed positions that will not change over time. This study compares inter-transponder distance over an implantation time period of 0-57 days in canine lung.

Method and Materials: A pulmonologist bronchoscopically implanted three transponders in a single lung lobe of five canines under an institutionally approved protocol. Distances between transponder pairs were measured over 0-57 days using the Calypso system. The positions were measured both when the dogs were breathing freely and during varied ventilatory amplitudes and frequencies, variable ventilation. In animals with at least two transponders, inter-transponder distances were calculated.

Results: The mean inter-transponder distances during breathing patterns were stable on the same day, at 2.32cm (free breathing) and 2.40cm (variable ventilation). One animal retained all 3 transponders at 57 days and exhibited significant change in inter-transponder distance from day 1-9. Changes in mean inter-transponder distance from day 9-29 ranged from 0.2–1.9mm. For reasons not understood, transponder distances on day 57 for one animal were larger at 2.0–6.5mm.

Conclusion: The inter-fiducial distance was stable regardless of breathing pattern on the same day. Measurements taken on the first day post-implant varied significantly from later measurements, probably due to local tissue trauma. Up to 30 days post-implant, the inter-transponder distances were stable. However, in one animal after 30 days, the relationship between transponder positions changed. More work is required to improve implant retention and to understand optimal transponder placement relative to a lung tumor target. Future studies will acquire more frequent transponder positions to be a more representative model of clinical patient data.

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