Introduction

Standard of care for many head and neck solid tumors in both human and veterinary medicine is surgical removal. Sentinel lymph node (SLN) mapping is often used for staging. Goggle augmented imaging and navigation systems (GAINS) is a wearable intraoperative system that perceives real-time fluorescence and aids in detection of both tumors and SLNs. This system detected tumors in subcutaneous and metastatic mouse models with 100% sensitivity and 98% +/- 5% specificity.1 Human pilot studies in breast cancer and melanoma patients show that GAINS detected SLNs with 100% sensitivity.1 This is the first trial evaluating GAINS in the dog.

In this pilot study, we hypothesized that the GAINS intraoperative system will aid in detection of the SLNs for both canine head and neck tumors.

Materials and Methods

Three dogs were enrolled who were previously diagnosed with a malignant head or neck tumor: squamous cell carcinoma (SCC,1), histiocytic sarcoma (1), and melanoma (1). Once placed under general anesthesia prior to surgical preparation, the patient was administered indocyanine green (ICG). The dye was injected in a four-quadrant approach around the tumor site(s).

The first two patients were administered a total of 0.2mg (0.5mg/mL) of ICG and the third patient was administered a total of 0.02mg (0.025mg/mL). A midline cervical incision was made to perform bilateral mandibular and medial retropharyngeal lymphadenectomy (figure 1).2 Lymph nodes were examined grossly for dye uptake and were examined using GAINS in-vivo (figure 1, 2 & 3). No surgical complications or adverse effects were appreciated with dye use.

Results

In each dog 1, 2, and 4 lymph nodes had ICG dye uptake. For two of the tumor types (SCC and histiocytic sarcoma) only the ipsilateral lymph node(s) were affected and for one of the tumor types (melanoma) all four of the lymph nodes had uptake. On histopathology none of the submitted lymph nodes had appreciable metastasis.

The GAINS pilot study was successful in identifying the SLNs in dogs with head and neck neoplasia at the subcutaneous level. Different doses of the ICG dye were tried to optimize detection of fluorescence by the imaging system and further dose studies are planned.

Discussion

Clinical feasibility and surgeon comfort using GAINS was demonstrated in this trial. Fluorescence was successfully visualized and superimposed on the normal color vision of 7 sentinel lymph nodes with the augmented reality system. The optimization of ICG dilution for this camera and goggle system needs to be further evaluated in dogs.

References


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