Scanning

Expression of the Na/I symporter (NIS) in thyrocytes permits isotopic scanning. The function of the NIS allows the thyroid gland to obtain the iodine it needs. Using active transport, and powered by a Na/K ATPase that creates a favorable gradient, the NIS transports one iodine molecule into the thyrocyte for every two sodium molecules it pumps out. Radiolabeled iodine can easily be substituted in, enabling the physician to measure the thyroid’s activity. Giving isotope 123I or low-dose 131I to the patient orally, then measuring the radioactivity emitted using a scintillation counter, can demonstrate both uptake of iodine and its organification. 99mTc pertechnetate (technetium-sestimibi 99) may also be used for this test. This isotope only measures iodine uptake, however, it is performed over a shorter time period and exposes the patient to less radiation.

The scan reveals the size and shape of the thyroid tissue and its activity. Graves disease, for instance, would show diffuse uptake increased from the normal on thyroid scan. If a patient has a distinct nodule, it may be categorized as “cold” or “hot”: “Cold” nodules reveal less activity on a radioisotope scan than the thyroid tissue surrounding them while “hot” nodules demonstrate more activity. While hot nodules are generally benign, thyroid scans cannot differentiate between benign and malignant cancer and with the advent of FNA (fine needle aspiration) biopsy, thyroid scans are rarely used as the initial means of evaluating a nodule. Their utility lies in the follow up of thyroid cancer.

After surgical removal and ablation of the endogenous tissue (using high doses of 131I), thyroid scanning is used to detect any areas remaining that are able to take up iodine (indicating the existence of cancerous tissue). Additionally, ultrasonography gives a more accurate picture of the presence of nodules, their size and the overall size of the gland, as well as any changes in size that occur over time. Ultrasonography also provides information on the characteristics of any nodules present; for instance, it can differentiate between a solid nodule versus a cystic lesion.

In addition to its roles in thyroid scanning, using high doses of 131I to ablate the gland and lesser doses to treat hyperthyroidism, NIS has unanswered questions associated with it. The symporter is also found in the ciliary body of the eye, salivary glands, gastric mucosa, choroid plexus, lactating mammary glands and placenta; at these sites, TSH does not regulate the transporter, as it does in thyroid tissue, and the overall physiologic significance is unknown. Mutations of the transporter lead to congenital hypothyroidism and related complications.

References:

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and a bright light, usually a headlamp the physician wears. In fiber-optic (also known as direct flexible) laryngoscopy, the physician passes the fiber-optic scope through the patient's nose in order to visualize the vocal cords. While direct laryngoscopy must be done under general anesthesia, indirect and fiber-optic laryngoscopy may be achieved in the physician's office, using a local anesthetic.

References: