Information on Endocrine Conditions

Thyroid
The Thyroid gland is situated in the front of the neck, just below the thyroid cartilage (Adam's apple). It has two lobes, one on the left and one on the right, and the lobes are connected by a small central region called the isthmus. Under normal circumstances, the thyroid gland cannot be felt since it is hidden underneath the muscle layers of the neck. However, enlargements of the thyroid gland can be detected and fall into two main categories, diffuse enlargement (goiter) and single lumps (nodules). The function of the thyroid gland is to make thyroid hormone, which then travels throughout the blood stream and has numerous effects on the various tissues in the body. In general, thyroid hormone is important in the regulation of the body's metabolism.

Types of Thyroid Diseases

- Surgery
- Post-operative instructions
- The MGH Surgical Experience

Thyroid diseases:
Thyroid diseases: Problems with the thyroid gland can be categorized into two groups, (1) abnormalities of function and (2) enlargement of the gland.

Abnormalities of function:
If the thyroid gland secretes too much thyroid hormone the result is called hyperthyroidism, and this is usually due to a condition called Grave's disease. Hyperthyroidism causes a number of symptoms, most notably an increase in heart rate, irritability, heat intolerance, and weight loss. The condition can be easily diagnosed with a blood test and can be treated in a variety of ways, including medications, surgery, or radioactive iodine treatment. Over the last decade, it has become clear that the best treatment for most patients with Grave's disease is radioactive iodine, since it cures the problem with minimal associated risks. There are selected patients who are determined not to be candidates for this treatment and are therefore given other therapeutic options, usually surgical resection of the thyroid gland.

When the thyroid gland makes too little thyroid hormone, the condition is termed hypothyroidism. This is a common problem, especially among women, and is also easily diagnosed by simple blood tests. The usual symptoms of hypothyroidism are weight gain, cold intolerance, and a loss of energy. In most cases, hypothyroidism is simply treated by taking thyroid hormone pills, generally one each day. Thyroid hormone medications are extremely safe and simple to use and the correct dose for each patient can be easily determined by a blood test.

Enlargement of the thyroid:
Diffuse enlargement of the thyroid is termed a goiter and is particularly common in certain regions of the world where there is an inadequate supply of iodine in the diet. In some patients with a goiter, the thyroid hormone levels are abnormal (either hyperthyroidism or hypothyroidism), but very often the thyroid hormone production is within the normal range. However, by taking thyroid hormone pills, one can sometimes decrease the growth of the goiter. This is a particularly important in patients with very large goiters, which can cause local compression symptoms, such as difficulties with breathing and/or swallowing. A large goiter can also be a cosmetic problem, since there might be a noticeable lump within the neck region.
Many patients with goiters have a "smooth" enlargement of the gland; but in some situations there is "multinodular" goiter. These nodules are almost always benign, but "dominant" nodules should not be overlooked, since on rare occasions they can be cancerous.

Thyroid Nodules:
Thyroid nodules are extremely common, especially in women between the ages of 20 and 40. The majority of thyroid nodules are benign and will not require surgical removal. However, it is important to evaluate each patient with a detectable thyroid nodule in order to ensure that it is not cancerous. A variety of tests are available to determine whether a nodule is benign or malignant, including thyroid scan, ultrasound, and fine needle aspiration biopsy (FNAB). Of these tests, the FNAB has most widely accepted as the best way to determine the nature of a given thyroid nodule. FNAB can be easily performed with a small needle and has almost no associated risks. However, the results of FNAB are not always definitive. Therefore, clinical decision-making as to the need for surgery must be based on a variety of factors (in addition to the biopsy results) including the size and nature of the nodule, its rate of enlargement, and a host of other factors which relate to the individual patient.

Thyroid cancer:
Of all the different types of cancer, thyroid cancer is probably the least aggressive. With appropriate treatment, the vast majority of patients with thyroid cancer can be cured and will lead normal, full lives. There are four major types of thyroid cancer: papillary, follicular, medullary, and anaplastic. The papillary and follicular forms account for about 90% of all thyroid cancers and can usually be treated successfully. Medullary cancer is unique in that it involves a small subset of cells within the thyroid gland (C cells) and is a problem that often runs in families. This form of cancer is also highly curable, but only if detected in its early stages. Anaplastic cancer is quite rare (approximately 3% of all cases) and usually occurs in elderly patients. Unfortunately, this form of thyroid cancer is quite aggressive and is almost never able to be cured.

Surgery:
Thyroid surgery at the MGH is performed in conjunction with the MGH Thyroid Unit, a multi-disciplinary center that brings together the expertise of endocrinologists, surgeons, radiologists, and pathologists in the management of patients with both benign and malignant thyroid nodules. Thyroid surgery is usually performed under general anesthesia and involves an incision in the front of the neck. Fortunately, the surgical scars are usually barely detectable once the healing process is completed, because the neck tissues tend to heal very nicely and the incision can be made along the normal skin creases that exist in each person. The extent of the thyroid gland to be removed will depend on the underlying problem, e.g., cancer vs. benign disease. A thyroid lobectomy involves removal of one lobe of the thyroid plus the isthmus, whereas a total thyroidectomy involves the removal of the entire gland. The latter operation is usually recommended for patients known to have thyroid cancer. Under some circumstances, lesser resections of the thyroid gland is quite appropriate, including a subtotal thyroidectomy which leaves just a small fraction of one lobe.

In most cases, patients stay one night in the hospital following their thyroid surgery, although some patients are able to go home the day of the surgery. The amount of pain is usually minimal, most patients requiring only mild, over-the-counter medications. The experienced endocrine surgeon will be skilled in avoiding injury to the four parathyroid glands, which lie adjacent to the thyroid gland. In some cases, following total thyroidectomy, the parathyroid glands will not work normally for a period of time, resulting in a decrease in the level of calcium in the blood (hypocalcemia), requiring calcium supplementation for several days or even weeks. Permanent hypocalcemia almost never occurs following thyroid surgery. The surgeon must also be careful to avoid injury to the various nerves that lie adjacent to the thyroid gland, the most important of which is the recurrent laryngeal nerve, one each side, which go to the voice box (larynx). Some patients will be hoarse following thyroid surgery, but like the parathyroid problem, this is almost never permanent.

Following surgery for thyroid cancer, some patients will require additional treatment with radioactive iodine. The decision to use this therapy is made in conjunction with the treating endocrinologist.

Parathyroid
Most people have four parathyroid glands, each of which is only about the size of a pea. Parathyroid glands are orange-yellow in color and are located adjacent to the thyroid gland. There are superior and inferior parathyroid glands on both the right and left sides. These glands produce...
parathyroid hormone (PTH), which is responsible for regulating the calcium level within our bloodstream. The major, clinically relevant disease related to the parathyroid glands occurs when they produce excess amounts of PTH, leaving to elevated calcium levels within the blood, a condition known as hypercalcemia.

- Hyperparathyroidism
- Surgery
- Post-operative Instructions
- Surgery at the MGH

Hyperparathyroidism:
The most common form of parathyroid excess is known as primary hyperparathyroidism and is usually due to enlargement (adenoma) of one of the four parathyroid glands, with excess production of PTH resulting in hypercalcemia. Occasionally, two of the four parathyroid glands become enlarged and this situation is known as a double adenoma. In rare instances, all four parathyroid glands are enlarged, a condition termed diffuse hyperplasia. This latter situation is often related to an underlying genetic abnormality and therefore this disease entity may run in families. Secondary hyperparathyroidism generally occurs in patients with chronic renal failure, and in this condition all four parathyroid glands become enlarged, producing excess amounts of PTH.

Years ago, the diagnosis of primary hyperparathyroidism was somewhat difficult, but it has been made very easy with improvements in our ability to detect the hormone (PTH) accurately. If a person has elevated PTH levels at the same time as an elevation in serum calcium, then the diagnosis of primary hyperparathyroidism is essentially secured.

The symptoms of hyperparathyroidism can vary from one patient to another. In severe forms of hyperparathyroidism, patients will often develop kidney stones or suffer weakening of the bones, leading to symptoms of pain and occasionally fractures. Most patients with primary hyperparathyroidism, however, have more subtle symptoms, such as increased irritability, short-term memory loss, abdominal pain, and easy fatigueability. Numerous studies of patients with primary hyperparathyroidism have revealed that these subtle symptoms often go unrecognized, but become apparent, in retrospect, once the condition is cured by an operation.

Parathyroid Surgery:
Most physicians recommend that patients with primary hyperparathyroidism undergo surgery in order to remove the enlarged glands, thereby curing the problem of excess hormone production and its resultant hypercalcemia. Surgery has been advocated even in patients who have no apparent symptoms related to the hyperparathyroidism, since there can be long-term negative effects in regard to bone strength, hypertension, kidney disease, etc. In some patients with other medical problems, surgery is not recommended, since the risks are felt to outweigh the benefits of curing the hyperparathyroidism.

The standard parathyroid operation includes an incision in the neck and identification of all four parathyroid glands, with removal of enlarged gland(s) (adenoma). The incidence of cancer within one of these parathyroid tumors is extremely low (~1%). In cases of four-gland hyperplasia, several surgical options are available, including the removal of three and a half of the glands. It is important to recognize that one needs only one normal-sized parathyroid gland in order to have adequate PTH production and normal calcium levels within the blood.

The cure rate for this standard operation is quite high (approximately 95%) and there are minimal risks associated with the surgery. The surgeon must be careful to avoid injury to the important structures adjacent to the parathyroid glands, most notably the recurrent laryngeal nerves. If one of these nerves is injured at the time of surgery, hoarseness will develop. In the hands of an experienced endocrine surgeon, however, this complication almost never occurs.

Recently a new approach to parathyroidectomy has been developed and has been called "minimally-invasive, radio-guided" parathyroidectomy (MIRP). In this operation, the patient is injected with a substance (sestamibi) prior to surgery, which becomes concentrated within the enlarged parathyroid gland. A special probe is then used at the time of surgery to help identify the precise location of the parathyroid adenoma, allowing for a smaller incision and less dissection of the other tissues within the neck. The success rate with this new technique has been extremely high, at least as good with the standard operation.
Regardless of the surgical approach used, most patients undergoing parathyroid surgery are able to be discharged from the hospital on the day of operation or after one night in the hospital. Most patients experience very little pain associated with the surgical incision. The recovery period is usually short, most patients returning to full activities within approximately seven days.

Prior to parathyroid surgery, some doctors will obtain one or more tests in an attempt to localize the enlarged parathyroid gland. Various studies have been used in this way, including ultrasound, MRI scan, CT scans, and sestamibi scans. Some surgeons will not order any of these tests prior to an initial operation for hyperparathyroidism. In the small number of patients in whom the initial parathyroid operation has been unsuccessful, a variety of tests are usually employed in order to try to localize the abnormal parathyroid gland, since it might be found in an unusual "ectopic" location, either high up in the neck region or even within the chest cavity.

Adrenal Glands
Each person has two adrenal glands, each located on top of either the right or left kidney. Adrenal glands are yellow-orange, crescent shaped organs which secret a variety of hormones. If the adrenal glands are completely non-functional, the resulting condition is known as Addison's disease. This can be dangerous if unrecognized, but otherwise can be treated with the appropriate hormone supplementation. In some situations, an adrenal gland enlarges and secretes excessive amounts of a particular hormone, These functional tumors are almost always benign in nature, but should be surgically removed in order to prevent the adverse effects of the excess hormone.

- Adrenal diseases
- Surgery

Adrenal tumors can be divided into two major categories, functional and non-functional. Non-functional tumors (also called incidentalomas) are usually found unexpectedly at the time of a radiological study that is being done for another reason, e.g. CT scan, MRI, or ultrasound. When an incidentaloma is found, one must first make sure that it, in fact is not producing any excess hormone. This can usually be done with simple screening tests of the blood and urine. If it is truly a non-functional tumor, then the main question is whether it is benign or malignant. The vast majority of incidentalomas are benign, especially when they are small (<5cm). If a non-functioning adrenal tumor is large in size, or is seen to get bigger on repeat radiologic tests, then surgical resection is usually recommended since there would be concern about harboring malignancy. Otherwise, small non-functional adrenal tumors can be safely observed over time and will not require any treatment.

Functioning adrenal tumors are categorized on the basis of the specific hormone, which they are producing and are described as follows:

Aldosteronoma: Excess aldosterone production leads to hypertension and low potassium levels within the blood (hypokalemia). These tumors are usually quite small (<3cm). The diagnosis can be elusive, but is usually considered when a patient has hypertension that is difficult to control with the normal medications, or if there is associated hypokalemia. Most patients with excess aldosterone are found to have a tumor within one of the adrenal glands and surgery is generally recommended since the operation is curative, preventing the long-term effects of hypertension.

Cushing's syndrome: If excess cortisol is being produced by an adrenal tumor, the result is Cushing's syndrome. Cushing's syndrome is characterized by a variety of signs and symptoms, most notably hypertension, weight gain, diabetes, muscle weakness, etc. As in other cases of functional adrenal tumors, if a patient with Cushing's syndrome is found to have an adrenal mass, then surgery is generally recommended and will usually be curative.

Pheochromocytoma: These adrenal tumors produce excess adrenaline (epinephrine) and noradrenaline (norepinephrine), leading to significant problems with hypertension. The symptoms of a pheochromocytoma are often episodic in nature and can include headache, sweating, chest pain, as well as high blood pressure. Surgery is almost always recommended in cases of pheochromocytoma and is usually curative. In rare instances, (about 10%) these tumors are malignant and spread to other organs such as the liver. Pheochromocytomas are also occasionally seen in unusual (ectopic) locations, generally in other areas within the abdominal cavity.
Adrenal surgery:
Adrenal surgery has been revolutionized recently with the advent of operative laparoscopy. A
laparoscope is like a telescope and through this "minimally invasive" approach an adrenal gland
can be removed, thereby minimizing the amount of post-operative pain and the overall recovery
period. In some patients with very large tumors of the adrenal gland (>8 cm) or other confounding
problems, the laparoscopic approach is not recommended and the standard, larger incision is
preferred. However, in most patients requiring an adrenalectomy, the laparoscopic approach is
appropriate.

Laparoscopic adrenalectomy is now being performed on a routine basis at the MGH. The benefits
of the minimally invasive approach are quite clear in regard to post-operative pain and length of
hospitalization. Most patients require only a single night hospital stay after the surgery. Patients
report a requirement for pain medications that lasts an average of seven days with a "return to
normal activities" by thirteen days. These results represent a significant improvement compared to
the standard open adrenalectomy that has been done in the past.