Cancer Treatment Strategies

Editor
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Endocrine Tumors

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Introduction

Endocrinology is relatively a new branch of physiology began with classic experiments of a French scientist Ernest Berthold (1849) on domesticated rooster [1]. William Bate Hardy (GB) is credited with coining the term hormone while visiting in the laboratory of Bayliss and Starling [2]. Hormones are chemical messengers pass through the blood and communicate signals from one type of cells to another and affect many vital processes [3]. Almost all the physiological system is regulated by these secretory molecules. Presently endocrinology comes up in existence with the emphasis of structural, functional, molecular and pathological knowledge of hormone and system related to the regulation. Hormone acts on target cell via specific protein receptors located either on the cell surface or in the cytoplasm or nucleoplasm [4]. Hormones-receptor complex initiate a series of molecular events through signal transduction which ultimately influence the function of cell [4].

On the basis of chemical nature, hormones are classified into three groups: amino acid derivatives, peptide hormones and lipid derivatives (steroid hormones and eicosanoids) [5]. These are different in their molecular structures and mechanism of action. Steroid hormones are secreted by the adrenal cortex and the reproductive glands. They have appreciable binding affinity with receptors present in the nucleus or in the cytoplasm of the cells and form hormone receptor (HR) complexes [6]. These HR complexes bind to the hormone response element, a region of the DNA of cells and exert a positive or negative effect on target gene transcription. Amino acid or peptide hormones are produced by the thyroid gland and adrenal medulla [7]. These hormones interact with the receptors that are already associated with specific DNA regions [8]. The interaction transforms the action of the affected genes and ultimately leads to cell type-specific responses. Several glands such as hypothalamus, pituitary gland, pancreas and parathyroid gland secretes polypeptide and protein hormones. These hormones interacts with the receptors present on surface of cell membrane and thus, initiates the function of cells.

Secretions of hormones are very vital for achieving an optimal biological functioning and health. Whenever there is excess or lesser secretion of a particular hormone, endocrine
disorders arises. The unwanted growth of tissues or cells that affects the parts of the endocrine glands that secrete hormones are known as endocrine tumor. Endocrine tumor starts in the cells that produces hormones, so that the tumor itself can make hormones and cause severe imbalance in hormone system and illness [9]. The main type of endocrine tumors is described as follows-

**Adrenal Gland Tumor**

Adrenal glands also called suprarenal glands are found in pairs on the top of each kidney [1,2]. It is triangular in shape, weighs about 5 g and measures about 50 mm in length, 30 mm wide and 10 mm thick [11,12]. The outer yellowish portion of the adrenal gland is called the adrenal cortex and inner reddish portion is known as adrenal medulla [11,13]. Adrenal cortex is divided mainly into three regions, first one is zonaglomerulosa, outer layer of adrenal cortex which produces mineralocorticoids mainly aldosterone, second one is zona fasciculata which secretes glucocorticoids popularly cortisol and the third one is zonareticularis which is the innermost layer secretes androgens, mainly dehydroepiandrosterone (DHEA), and androstenedione (the precursor to testosterone sex hormone) [14]. Aldosterol hormone regulates salt and water balance in the body, and cortisol regulates carbohydrate, protein, and fat metabolism in the body [15]. During stress conditions [16] adrenal medulla produces hormones called catecholamines such as adrenaline (also called epinephrine) and noradrenaline hormone (also called norepinephrine) [17]. These hormones are responsible for faster heart beat, sweating, increase in blood supply and also cause widening of the eyes [16].

A tumor can develop either in the cortex or medulla part of the adrenal gland and also it is possible that it can be cancerous (malignant) or non-cancerous (benign) [18,19]. Generally tumor is found in only one gland and rarely both gland are affected known as bilateral adrenal tumors. Some adrenal gland tumor produces the excess amount of hormones and therefore, shows dramatic symptoms, because of these reasons they are known as functioning tumors [19,20]. On the other hand, some adrenal gland tumors are called non-functioning because they produce no hormones, and therefore they do not show any obvious symptoms [19,20]. Benign tumors and malignant which are developed in adrenal cortex part are known as adrenal cortical adenomas and adrenal cortical carcinomas respectively [20].

**Adrenal cortical adenomas**

These are the most common type of adrenal gland tumors but uncommon in patients younger than 30 years old. Several advance technologies are utilized to treat cancer such as chemotherapy, radiation therapy and hormonal therapy may also be employed in the treatment of this disease, including surgery and thermal ablation [20-22]. It is generally non-functioning tumor and therefore, usually does not show any symptoms in the early stages [22]. However, some adrenal cortical adenomas are functional tumors and overproduce several hormones such as mineralocorticoids, glucocorticoids and androgens which cause several endocrine disorders such as Conn’s syndrome (hyperaldosteronism, overproduction of Aldosterone hormone), Cushing’s syndrome (overproduction of glucocorticoids), virilization of females, or the feminization of males [22-26]. Symptoms of Conn’s syndrome include high blood pressure, low potassium level in the blood, hypertension, weakness, muscle cramps, increased thirst and frequent urination [24-28]. Surgical adrenalectomy and laparoscopic adrenalectomy methods are used to remove the adrenal gland to treat Conn’s syndrome [27-29]. Cushing syndrome (also called Itsenko-Cushing syndrome, hyperadrenocorticism or hypercorticism) show several
symptoms, including high blood pressure, impaired glucose tolerance or diabetes, hyperlipemia and osteoporosis, weakness in the legs, depression, fat deposit behind the neck and shoulder, hair growth on face, chest and back in women, purple stretch marks on the stomach and neck and central obesity [23,29-33]. Removal of the adrenal gland is one of the options to treat Cushing syndrome [30,31,33]. Several drugs, including ketoconazole, metyrapone, mitotane, or etomidate, cabergoline, octreotide, and mifepristone are used to treat Cushing syndrome [33].

**Adrenocortical carcinoma**

It is a rare and highly aggressive form of cancer found in cortical cells of the adrenal gland [20]. It can be a functional or non functional tumor depending on the secretion of hormones [20,35]. It can show similar symptoms to the adrenal cortical adenomas, but sometimes it might be different [20,35]. It can develop at any age, but accumulating data suggested that it is more frequent in adults whose age is 40-50 years [36]. Surgery of adrenal gland is most preferred options to treat adrenocortical carcinoma, although several other treatments are also given along with this such as chemotherapy, and radiofrequency ablation [37].

**Pheochromocytoma**

It is an endocrine tumor found in the medulla of the adrenal gland and overproduce catecholamines, usually epinephrine (adrenaline) and norepinephrine (noradrenaline) [23]. Because of excess secretion of the hormone, they show numerous symptoms such as high blood pressure, headache, palpitations, anxiety attacks, excessive sweating, weight loss, and pallor [23,38]. This tumor can be found in patients of multiple endocrine neoplasia and Von Hippel–Lindau (VHL) [39-41]. It can be diagnosed by measuring the concentration of cortisol and catecholamines or metanephrines in the blood or urine. Advance Imaging technology such as ultrasound, magnetic resonance imaging or computed tomography of head, neck, chest or abdomen can be used to localize the tumor [43].

**Neuroblastoma**

It is a very common cancer often found in children and originates in the medulla part of the adrenal gland [44]. Moreover, it is also an aggressive cancer of immature neuroblastic cells and sometimes do not show any symptoms [45]. Common symptoms of this disease are loss of appetite, fever, fatigue and joint pain. It can show swollen belly and constipation in the abdomen, breathing problems, bruising and swelling of eyes and weakness [44,46]. Neuroblastoma also secretes hormones, causing symptoms such as constant diarrhea or high blood pressure [47]. This tumor is generally diagnosed by biopsy and also the level of catecholamine hormone is measured in the urine for the diagnosis. Moreover, blood and urine test, molecular genetic studies, computed tomography (CT) scan, positron emission tomography (PET) scan, magnetic resonance imaging (MRI), and bone scans are the methods utilized to diagnose this disease [44,46].

**Adrenal incidentalomas**

Adrenal incidentaloma is a mass lesion, generally 1 cm or more in diameter, discovered incidentally by advance imaging such as computed tomography (CT), magnetic resonance imaging (MRI), or ultrasonography [48]. In case of older, obese, diabetic, and hypertensive patients, the prevalence of adrenal incidentaloma is higher [49,50]. These masses are may be non-functional (do not secrete hormone) or functional and also may be malignant or benign in nature [49,50] (Figure 1).
For the functional tumors, adenalactomy is required to remove the gland and tumor. In case of non-functional tumors, the size and imaging characteristics of the tumor as well as the patient’s age and other health problems will determine for the adenalactomy. If the operation is unsuitable for the patient, then observation or close follow-up is the best treatment to see if the tumor becomes functional. The risk that a tumor will become hyperactive is greatest in the first 4 years which can develop in to Cushing’s syndrome.

![Figure 1: Adrenal gland tumor.](image)

**Gastrointestinal Tumor**

The gastrointestinal tract is part of body digestive system, which helps to digest food and also help in excreting the waste material from the body [51]. Stomach, small intestine, large intestine (colon and rectum) are main parts of the gastrointestinal tract. It is very well documented that certain type of neuroendocrine cells is found in the gastrointestinal tract which produce hormones to help in moving food through the stomach to intestine [51]. In these types of neuroendocrine cells gastrointestinal carcinoid tumor can begin which can also make hormones and release them into the body [58]. These types of tumor are very rare and slow growing which can occur in the appendix, small intestine and rectum. The person who has a family history of multiple endocrine neoplasia type 1 (MEN1) syndrome or neurofibromatosis type 1 (NF1) syndrome are more prone to gastrointestinal tumor [51]. Moreover, the person
suffering from atrophic gastritis, pernicious anemia, or Zollinger-Ellison syndrome is also more prone to gastrointestinal tumor [59]. Most of the time initially they do not show any symptoms but later on when they spread they can show many symptoms. Release of serotonin and other substances from the tumors of gastrointestinal tract show many symptoms including flushing of the face, abdominal pain, diarrhea, fast heartbeat, bronchial spasms and sudden drops in blood pressure as mentioned-above [60]. Several lab tests and imaging technology are used to detect and diagnose cancer including blood and urine test, tumor marker test, magnetic resonance imaging (MRI) PET scan (positron emission tomography scan), CT scan, endoscopic ultrasound, colonoscopy, capsule endoscopy and biopsy [61]. Several treatment options are available for patient suffering from a gastrointestinal tumor such as surgery, radiation therapy, chemotherapy and hormone therapy [51].

Lung Carcinoid Tumor

We know that lungs also contain neuroendocrine cells, which secrete hormone and they help to detect the level of oxygen and carbon dioxide in the breath air and release chemical to send the message to adjust these changes [58]. The tumor which develops in these neuroendocrine cells are known as a lung carcinoid tumor, which is extremely uncommon and grow very slowly as compared to other types of lung cancer [59,62]. There are following four types of lung carcinoid tumors.

Small cell lung cancer

It is one of the fastest growing cancer cells, which multiplies quickly and spread to other organs such as lymph nodes, bones, brain, adrenal glands, and liver. It spread so early and due to this reason, chemotherapy is a better choice to treat this as compared to surgery [63].

Non-small cell lung cancer

There are three types of non-small cell lung cancer, squamous cell cancer, adenocarcinoma and large cell carcinoma. Squamous cell cancer and adenocarcinoma develop from the cells that line the airways of the lungs. Large lung cell carcinoma is called because they appear larger in size under the microscope and also it is well documented that these types of cells grow very quickly [64,65].

Typical lung carcinoid tumor

Typical lung carcinoid tumor, also known as typical pulmonary carcinoid tumor, is a slow growing tumor which rarely spread to other organs. It is typically present with cough or hemoptysis. They are diagnosed by microscopic examination and treated by surgical excision [58].

Atypical carcinoid tumor

Atypical carcinoid tumor is faster and can spread to other organs as compared to typical carcinoid tumor [58].

Pancreatic Tumor

The pancreas is a gland found in the abdomen and also an integral part of both digestive and endocrine system, which secretes hormone to regulate the body and also digestive enzymes
to break down food into smaller parts [66]. There are mainly two types of cell, exocrine and endocrine, which are found in the pancreas. Exocrine pancreatic cells produce enzymes and release it into the small intestine which helps in digestion of food, particularly fats [67]. On the other hand, endocrine pancreatic cells, also known as islet cells or islets of Langerhans, secrete several type of hormones including insulin, which helps in controlling the blood sugar level in the body [66-68].

It is well established that pancreatic cancer is one of the major causes of cancer death in the world [69]. As mentioned above two types of cells are found, therefore, pancreatic cancer is categorized into two group adenocarcinoma, which begins in exocrine component and pancreatic neuroendocrine tumor, which begin in the endocrine component [70,71]. The adenocarcinoma is a common form of pancreatic and it is a major cause of pancreatic cell death while as neuroendocrine tumor is very rare, comprise only 1 to 5% of all pancreatic cancers [72].

**Pancreatic neuroendocrine tumors**

Pancreatic neuroendocrine tumors can also be called a pancreatic islet cell tumor, pancreatic endocrine tumor or islet of Langerhans tumor [70,71]. Generally following types of islet cell tumors are classified.

Nonfunctioning tumors: Pancreatic neuroendocrine tumors are generally nonfunctioning tumors which do not show hormonal symptoms, and therefore, they are usually diagnosed at more advanced stages of disease [73].

Functioning islet cell tumors: These tumor cells show dramatic symptoms because of excess secretion of different types of hormone into blood [73,74]. They are classified into five types based on the hormone normally produced by the cells.

- **Gastrinoma:** These tumor cells produce excess amount of gastrin, which produces acid in the stomach which can cause severe ulcer [75].
- **Insulinoma:** These tumor cells produce excess amount of insulin causing hypoglycemia (low blood sugar) [76].
- **Glucagonoma:** These tumor cells produce excess amount of the hormone glucagon causing hyperglycemia (High blood sugar) [77].
- **VIPoma:** It is an extremely rare islet cell tumor that produces excessive amounts of vasoactive intestinal peptide (VIP),, which can cause watery diarrhea, called Verner-Morrison syndrome [78].
- **Somatostatinoma:** It is also an extremely rare tumor that produces excessive amounts of somatostatin, which stops the secretion of several other hormones, including growth hormone, insulin, and gastrin [79].

**Symptoms of pancreatic cancer**

Non functional endocrine tumor usually takes longer time to spread other parts of the body without showing any symptoms. Later, when they grow and spread into many parts of the body they can show several symptoms, including indigestion, diarrhoea, pain in abdomen or back, a lump in the abdomen, whites of the eye and yellowing of skin [80]. Functional endocrine tumor secretes several types of hormones which show dramatic changes in the body and can show several symptoms depending on types of tumors. Insulinoma can show symptoms such as low
blood sugar which can cause headache, blurred in the vision, tired, weak, shaky, nervous, irritable hungry and fast heart beat while as glucagonoma can show symptoms such as high blood sugar which can cause frequent urination, headaches, dry skin and mouth, or feeling thirsty, hungry, weak or tired [81]. It can also show other symptoms including skin rash on the stomach, face, or legs and blood clots which can cause shortness of breath and cough in the lung or pain in the chest and also can cause swelling, pain, warmth, or redness in the arms or legs [81]. Somatostatinoma can show symptoms such as high blood sugar which can cause frequent urination, headaches, dry skin and mouth, or feeling thirsty, hungry, weak or tired. It can show other symptoms such as diarrhea, gallstones, weight loss, whites of the eyes and yellowing of the skin [82]. Furthermore, gastrinoma can show symptoms such as stomach ulcer, pain in abdomen and diarrhoea [70,83,84]. VIPoma can cause diarrhea, dehydration, low potassium level in the blood, cramps or pain in the abdomen and weight loss [83,84].

**Detection of pancreatic tumor**

Several techniques and imaging technologies are available to detect and diagnose pancreatic cancer [85,86]. Moreover abdominal CT scan, magnetic resonance imaging (MRI), somatostatin receptor scintigraphy, endoscopic ultrasound (EUS), endoscopic retrograde cholangiopancreatography (ERCP), angiogram, laparotomy, intraoperative ultrasound, biopsy and bone scan lab tests/imaging techniques are available to detect and diagnose pancreatic cancer [71,87-90].

Other type of lab tests to detect different types of pancreatic endocrine tumor are as follows [70,71,75,91,92].

Test for gastrinoma tumor: (a) Secretin stimulation test, (b) Fasting serum gastrin test, (c) Basal acid output test, (d) Somatostatin receptor scintigraphy.

Test for insulinoma tumor: Fasting serum glucose and insulin test

Test for glucagonoma tumor: Fasting serum glucagon test

Test for VIPoma tumor: (a) Serum VIP (vasoactive intestinal peptide) test, (b) Stool analysis, (c) Blood chemistry studies.

Test for somatostatin: (a) Fasting serum somatostatin test, (b), Somatostatin receptor scintigraphy.

**Treatment of pancreatic tumor**

Nowadays, several advanced technologies are available to treat this disease. The most common option is surgery, however many other options are also widely used such as radiofrequency ablation, chemotherapy, interferon, transplantation, and angiographic chemoembolization [92-94].

**Parathyroid Tumor**

Parathyroid glands are four small endocrine glands located in the neck region of our body [95]. These glands secrete a hormone called parathyroid hormone (PTH) which regulates calcium and phosphorus levels in the blood [95-97]. Over secretion of parathyroid hormone called hyperparathyroidism caused several problems, including osteoporosis, ulcers, pancreatitis, kidney stones and mental disorders [95,98]. Generally, the overgrowth tissue which secretes
excess amount of PTH hormone is non malignant known as parathyroid adenomas (benign parathyroid hormone secreting tumors) [99,100]. In most of the patients, only one parathyroid gland in affected and in a few cases, two or three glands are affected and in extremely rare cases, all four glands are affected [95].

**Symptoms of parathyroid tumor**

Moreover, in general, parathyroid cancer is very rare, and it secretes huge amount of PTH hormone, which mobilizes huge amounts of calcium (this condition is called hypercalcemia) from the bones, releasing this calcium into the blood stream [101]. People suffering from multiple endocrine neoplasia type 1 or autosomal dominant familial isolated hyperparathyroidism or hyperparathyroidism-jaw tumor syndromes are more prone to Parathyroid Tumor [102].

**Detection of parathyroid tumor**

Parathyroid tumor can be detected by measuring calcium and PTH level in the blood [103]. Neck ultrasound and sestamibi scan are generally done to detect that which parathyroid gland is abnormal [104,105].

**Treatment of parathyroid tumor**

This cancer can be treated by surgery of the parathyroid glands, and generally, radiation therapy is used to kill cancer cells [106,107]. The reports show that usually chemotherapy is not used for treating this disease because presently no effective drug is available in the market [107].

**Pituitary Gland Tumor**

It is a small gland found inside the skull, just above the passage of the nose, and it is also known as the master gland because it secretes several hormones which control many endocrine functions [108]. It is connected directly to part of the brain known as the hypothalamus. The pituitary gland is divided into two parts, anterior lobe and posterior lobe [108-110]. The anterior pituitary is larger front part of the gland secretes different hormones. Growth hormone (GH) or somatotropin is mainly secreted in children to promote body growth during childhood [109,111]. A very little amount of GH is found in adults and the condition in which an adult makes too much GH is known as acromegaly. Thyroid-stimulating hormone(TSH)or thyrotopin promotes the release of thyroid hormone and growth of the thyroid gland [109,112]. Adrenocorticotropic hormone (ACTH)or corticotropin promotes the release of steroid hormones and growth of the adrenal glands [109]. Luteinizing hormone (LH) orluteinopromotes and help in development of the corpus luteum [113]. Follicle-stimulating hormone (FSH)stimulates the growth of immature ovarian follicles in the ovary [114]. Prolactinpromotes milk production in women [115]. The smaller back part of the pituitary gland is known as the posterior lobe which secretes mainly two hormones Oxytocin and Vasopressin. Oxytocinpromotes to release milk from breast and also help the women to contract her uterus during child birth [116]. Vasopressin is also called antidiuretic hormone (ADH), helps to retain water in the body through increasing water absorption in the collecting ducts of the kidney nephron. Moreover, it also plays a role in constricting the blood vessels in the body [117].

The tumor can develop in the pituitary gland region. It can be either functional or non-functional tumor. The functional tumor overproduces the hormones whilst non-functional tumor does not produce hormones [118-121]. The pituitary gland tumor shows several general
symptoms, including headache, loss of vision, weight loss, Cushing’s syndrome, acromegaly, sweating and infertility [109,118]. Generally pituitary tumors are benign (non-cancerous), but sometimes they are cancerous also. They are classified into pituitary adenomas, invasive pituitary adenomas and pituitary carcinomas.

**Pituitary adenomas**

These are benign pituitary tumors, which are non-cancerous and do not spread outside the skull. They remain within the skull and do not have enough space to grow. Depending on the size of the tumor they are divided into microadenoma and macroadenoma. Microadenoma are smaller than 1 centimeters (cm) across and sometimes very difficult to detect because of their smaller size while macroadenoma are equal to or greater than 1 centimeter (cm) across and detected easily because of the larger size [109,118,119]. Most of the pituitary adenomas are microadenoma and often discovered incidentally known as incidentalomas [119]. They are often discovered during the examination of patients for the unrelated conditions, for example, headache and dizziness [122]. Sometime pituitary adenomas grow in an abnormal place, most particularly in the sphenoid sinus, suprasellar region, nasopharynx and the cavernous sinuses region, referred as an ectopic pituitary adenoma [123,124].

**Invasive pituitary adenomas**

These tumors are generally not malignant. We know that pituitary adenomas are slow-growing tumors, which are found within the sella turcica region of the brain, and when become aggressive and infiltrate the dura mater, cranial bone, or sphenoid sinus region, they are referred as invasive pituitary adenomas [125-127]. Usually surgery and radiotherapy techniques are used for treating this disease [110].

**Pituitary carcinomas**

Only few pituitary tumors are malignant and grow in other parts of the body. They spread to other parts of central nervous system and sometimes even spread outside the central nervous system [109,110].

Currently pituitary tumors can be diagnosed by utilizing several modern techniques and lab tests, including blood tests, Computed tomography (CT) scan, biopsy, lumbar puncture (spinal tap), and magnetic resonance imaging (MRI) [110,128]. Several types of treatment options are available for patients suffering from pituitary tumors such as surgery, chemotherapy, and radiation therapy [128,129].

**Other sporadic pituitary tumors**

Despite of the above types, there are many other benign as well as some malignant pituitary tumors which are much less common than adenomas. Out of these, teratomas, germinomas, and choriocarcinomas are some exceptional tumors that usually occur in children or young adults. Gangliocytomas and Rathke cleft cysts are uncommon tumors of pituitary more often than not found in adults. Craniopharyngiomas are more common in children but exceptionally in older adults. These are slow-growing tumors that start above the pituitary gland and compressing hypothalamus as well as the pituitary gland, causing hormonal tribulations. They Cancer that starts in sites other than the pituitary can metastasize to the pituitary and are not classified as pituitary tumors [109] (Figure 2).
Thyroid Tumor

It is an endocrine gland which is found just above the voice box and contain two parts or lobes (right and left lobes) and made up of two types of follicular cells, which produces thyroid hormone (thyroxine, T4 and triiodothyronine, T3), which is important for normal functioning of the body and C cells, which produces calcitonin, a hormone that helps in calcium metabolism [130]. Thyroid gland needs a sufficient quantity of iodine, which is required for normal functioning of the thyroid gland [131]. Iodine is found in the food, including seafood and dairy products [131]. Overproduction of thyroid hormones is known as hyperthyroidism, and low production of thyroid hormones is known as hypothyroidism or myxoedema [132]. Losses of weight, feeling hungrier, shaky, anxious and faster heart rate are some symptoms associated with hyperthyroidism and in case of hypothyroidism weight gain, tiredness and lethargic are some symptoms associated with it [133,134]. If the level of thyroid hormone decreases in the blood, hypothalamus releases thyroid-releasing hormones into the blood which activates the pituitary gland to produce a thyroid stimulating hormone, and this thyroid stimulating hormone stimulates the thyroid gland to produce more T3 and T4 thyroid hormones [135,136].

Thyroid cancer is uncommon, but it is more common in women as compared to men [137]. Usually in men it is found in older age and very rare in children but in women, it is found in
younger age [137,138]. Thyroid cancer is categorized into following types [139-142].

**Papillary thyroid cancer (PTC)**

It is one of the most common types of thyroid cancer generally found in younger women and develops from the follicular cells and grows very slowly. Out of all the thyroid cancers, 80-85% are PTC.

**Follicular thyroid cancer (FTC)**

It is less common and develops from the follicular cells and grows slowly. Both papillary and follicular thyroid cancers are differentiated thyroid cancer. FTC makes up about 7-15% of all the thyroid cancers.

**Medullary thyroid cancer (MTC)**

This is a rare type of cancer develops in C cells and persons suffering from multiple endocrine neoplasia type 2 (MEN2) are more prone to this disease. About 3% to 5% of all the thyroid cancers are MTC type.

**Anaplastic thyroid cancer (ATC)**

This is very rare, fast growing and poorly differentiated thyroid cancer affecting 1-2% of all the thyroid cancer patients.

**Thyroid lymphoma (TL)**

This is the rarest (<0.5%) type of thyroid tumor found mainly in female, where non–Hodgkin’s B-cell lymphomas is found in most cases and also Hodgkin’s lymphoma is identified in few cases. The causes of thyroid cancer in most of the patients are unknown but there are some risk factors, which increase the chance of developing cancer such as benign thyroid disease, exposure to radiation, inherited faulty gene and weight gain [136,143]. Several advance technology and laboratory tests are available to detect and diagnose thyroid cancer such as the blood test (To detect T3, T4 and calcitonin hormone), ultrasound thyroid scan, biopsy, magnetic resonance imaging (MRI), computerized tomography (CT) scan, positron emission tomography (PET), vocal card check, and full body scintigraphy using iodine-131 [136,144-146]. Several types of treatment options are available to treat thyroid cancer. Usually surgery is the first choice to treat thyroid cancer in which thyroid gland is removed from the body [147]. Also hormone therapy and radiotherapy is used to treat this disease, however chemotherapy is generally not used for treatment purposes [148,149].

**Concluding Remarks**

Tumors associated with the hormone secreting glands are known as endocrine tumors which is one of the dreadful diseases in the world and millions of people are dying each year because of this. In this regard, cancer is a curable disease, if detected at an early stage, but at metastatic stage, this disease becomes very dangerous and also becomes less chance to cure this malady. Several modern technologies and tools have been developed in the last few years to diagnose this disease but even though we are unable to diagnose this disease at an early stage. Therefore, extensive research is required to develop cancer diagnostic tools, which should be very effective for the detection of tumors at an early stage.
The most important point is the treatment strategies which are utilized to cure this disease. Nowadays, chemotherapy, hormonal therapy and surgery are generally used for treatment. Surgery is one of the most common options used to treat this disease at the beginning, but in many cases these approaches are not very much successful, thus alternative strategies are required for this. In many tumors, chemotherapy is not very much successful and this demand development of novel anticancer agents which could be applicable for this. We need to work in a distinct way to develop new therapeutic tools for cancer. In addition, the treatment strategies which are available currently is very costly and not affordable by the patients belongs to the developing or undeveloped countries. Low cost treatment strategies should be available for the patients and for this, we need to develop novel cheap anticancer drugs and other low cost diagnostic tools required for treating this disease. Now the time has come that awareness and valuable information regarding cancer should reach to the common people so that they should go for health checkup regularly.

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