Oncology and Radiotherapy ©
Vol.17 Iss.10: 001-009 • RESEARCH ARTICLE

Thyroid carcinoma management approaches in mosul city

Amina Nazar Abdulrazaq[1], Ammar H. Yahia[1], Ahmed Sabah Mohammed Jameel[2]

[1] Al-Quds Family Medicine Center, Nineveh Directory of Health, Mosul, Iraq

[2] Radiation Oncology Department, Oncology and Nuclear Medicine Hospital, Mosul, Iraq

Abstract

Thyroid cancer is the most commonly diagnosed endocrine cancer worldwide. In Iraq during 2020, the recorded new cases of thyroid cancer were 1,660(4.9%), which ranked in 5 position. To describe the management approaches of thyroid cancer at Nuclear Medicine department at Oncology and Nuclear Medicine hospital in Mosul city. A descriptive cross-sectional study design was conducted in the Nuclear Medicine Department at Oncology and Nuclear Medicine Hospital, Mosul, Iraq from January 2021 to July 2021. The dose and number of RAI doses were determined, which started from 30 mCi, 50 mCi, 100 mCi, 150 mCi and 175 mCi. A total of 213 patients (175 females and 38 males) with mean age (41.6 ± 13.2) years diagnosed with thyroid cancer. The M : F ratio was 1:4.6. The majority of patients undergoing total thyroidectomy in 164(77%) of patients. The most common complication of surgery of thyroid cancer recorded in this study was thyroid insufficiency in 146(68.5%) of patients. Approximately, 191/213 (89.7%) of patients received RAI as diagnostic or therapeutic doses. Nearly all patients 212(99.5%) received hormonal replacement therapy of synthetic Levothyroxine. Only one patients with ATC received chemotherapy and radiotherapy. The fourth and fifth decade of life are the prevalent age groups diagnosed with thyroid cancer. Females are still the predominant gender for thyroid cancer. The radical surgery are better approaches to decrease recurrence, increase survival and good prognosis. RAI and hormonal replacement therapy are better adjuvant therapy.

Key Words: thyroid cancer, radioactive iodine, papillary Tc, levothyroxine, total thyroidectomy

Address for correspondence:
Amina Nazar Abdulrazaq
Al-Quds Family Medicine Center, Nineveh Directory of Health, Mosul, Iraq E-mail: dr.aminanazar@gmail.com

Word count: 5508 **Tables:** 12 **Figures:** 00 **References:** 46

Received: 29 September, 2023, Manuscript No. OAR-23-115210
Editor assigned: 30 September, 2023, Pre-QC No. OAR-23-115210 (PQ)
Reviewed: 13 October, 2023, QC No. OAR-23-115210 (Q)
Revised: 23 October, 2023, Manuscript No. OAR-23-115210 (R)
Published: 31 October, 2023, Invoice No. J-115210

INTRODUCTION

Thyroid cancers represent the most common endocrine neoplasms and comprise a spectrum of malignancies ranging from rarely lethal, slow-growing neoplasms to among the most aggressive cancers to afflict humanity [1, 2]. In the United States during 2018, the estimated new thyroid cancer cases were 53,990 (of these, 40,900 in women) [3]. In Iraq during 2020, the recorded new cases of thyroid cancer were 1,660(4.9%), which ranked in 5 position [4].

The goals of patient management are to minimize morbidity and mortality from cancer (tumor recurrence, metastases, and death) as well as from therapy [surgery, hypothyroidism, iodine-131 (131 I) therapy, thyroid-stimulating hormone (TSH) suppression] while still achieving a favorable outcome [1]. Recently, the degree of consensus have been achieved with regard to the primary evaluation of nodules and the management of thyroid cancer, but important biologic and clinical questions remain unanswered [5-7]. At initial assessment, patients with thyroid cancer may have a palpable neck mass, which may represent the primary intra-thyroidal tumor or metastatic regional LAP. It may be clinically occult and the impalpable lesion may first be recognized on high-resolution neck imaging, fueling the thyroid cancer epidemic of small PTCs, or during the course of a neck exploration for presumed benign thyroid disease [2]. The most common clinical features for FTC is a single and painless thyroid nodule, and if it is widely invasive, usually present with a palpable neck mass, which, if minimally invasive, might be diagnosed incidentally [8, 9]. FTC and HCC may also present with hoarseness, dysphagia, neck pressure, and even with thyrotoxicosis clinical manifestations [10]. While the MTC clinical presentation varies; familial cases present at a younger age, whereas the sporadic form occurs between

the 4th and 6th decades of life. The most common form of MTC is sporadic (80%); it usually present as an isolated thyroid nodule and metastases to local LNs occur frequently (80% of patients with a palpable tumor) [11]. Patients with ATC may present with a rapidly expanding neck mass requiring rapid histopathologic confirmation of the diagnosis [6].

Laboratory tests and tumor markers for investigated TC including serum TSH, T3 and T4, serum calcitonin, S. T. g, and Tg Ab [6].

Ultrasonography is the primary imaging modality recommended to confirm the presence of a nodule, to document the presence of other more clinically significant nodules, to identify suspicious sonographic features in nodules, and to document the presence of abnormal regional adenopathy [5].

CT scan is a useful method for the detection of recurrence, especially in retrosternal and peri-tracheal regions and also helpful for the evaluation of distant metastases. MRI used for the detection of well differentiated TC, particularly carcinoma, metastatic to cervical lymph nodes [2, 5, 6].

Indications for radioisotope scanning are to determine the functionality of a single nodule or nodules in a multinodular gland [5, 6]. Isotopic Imaging (e.g. Pentavalent Tc-DMSA (V-DMSA), I or I-MIBG, Tc-MIBI, 18F-FDG-PET) is helpful in assessing thyroid lumps and to detect metastatic MTC (sensitivity of 68% and specificity of 100%) [6].

It is generally recognized that FNA biopsy is the most effective method available of preoperatively distinguishing between benign and malignant thyroid nodules [2, 5]. The diagnosis of FTC or HCC depends on the demonstration of invasion of the thyroid capsule or the adjacent blood vessels [5].

Surgery is the standard primary treatment for differentiated thyroid cancers, but the extent of initial surgery is an area of considerable controversy [12]. Various surgeons have advocated ipsilateral thyroid lobectomy with isthmectomy, bilateral subtotal thyroidectomy, and near-total or total thyroidectomy [2]. Recently, the most recent DTC ATA-practice guidelines recommend as initial treatment for microcarcinoma a lobectomy and for TC more than 1 cm but less than 4 cm, surgical treatment can be either a bilateral procedure (near total thyroidectomy or total thyroidectomy) or a unilateral procedure (lobectomy) [12]. Modified radical neck dissection is indicated for gross nodal metastases found before or during surgery, and it may improve the outcome of older patients with PTC with larger tumors or evidence of extra-thyroidal invasion [2].

Postoperative thyroid suppression therapy for Follicular Cell–Derived Thyroid Cancer (FCDC) is based on administration of oral doses of thyroxine. It is assumed that suppression of endogenous TSH deprives TSH-dependent differentiated FCDC cells of an important growth-promoting influence [2]. Traditionally, the goal of thyroxine therapy has been complete suppression of pituitary TSH secretion, as indicated by undetectable levels of serum TSH when measured in sensitive immunometric assays. Current ATA-practice guidelines provide a clinical framework for TSH suppression with complete and partial suppression for patients at high risk and intermediate risk DTC, respectively, whereas keeping the TSH in the lower range of the normal value for low-risk tumors [12].

The concept of adjuvant radioactive iodine (RAI) therapy originated from treatment approaches to metastatic TC and was based on an equally compelling physiologic premise [13-17].

Historically, indications for External Beam Radiation Therapy (EBRT) have included residual macroscopic or microscopic disease, extrathyroidal extension, multiple lymph node involvement, Hürthle cell histology, older age of patients, large tumor size, and residual disease that does not take up RAI [18-21]. Advances in treatment modalities include IMRT, and proton treatments are increasing the dose escalation may be more readily achievable in the adjuvant setting without increasing toxicity to OAR [21-23]. Stereotactic body radiotherapy has been proposed as a highly targeted technique that is efficient (one to three treatments) and effective in controlling cervical lymph node recurrence of nonanaplastic thyroid cancer (100% tumor control) with no serious adverse events [24].

The most active single agent reported in the systemic treatment of thyroid cancers is doxorubicin (Adriamycin) [25,26], other active agents include cisplatin, oxaliplatin, carboplatin, taxanes, gemcitabine and etoposide [27]. Overall, no advantage was seen to the combination drug regimen over doxorubicin alone [2].

The most promising targeted therapies for advanced thyroid cancer are kinase inhibitors [28]. Two kinase inhibitors have been FDA approved for advanced radioiodine-refractory DTC (RAIR-DTC): sorafenib (2013) and lenvatinib (2015). Other vandetanib (2011) and cabozantinib (2012) are two kinase inhibitors FDA-approved for progressive and metastasized MTC [28-30]. At the Mayo Clinic, pazopanib (2014) used in both FDTC and, MTC [31, 32]. Most recently on 2018 the FDA approved the combination dabrafenib/trametinib for BRAF V600E mutated non-resectable or metastatic ATC. Dabrafenib is a BRAF inhibitor, while trametinib is a MEK inhibitor [33].
The study aimed to describe the management approaches of thyroid cancer at Nuclear Medicine department at Oncology and Nuclear Medicine hospital in Mosul city.

METHODS

Ethical and administrative considerations

The Medical Ethical Committee of Arab Board of Medical Specializations approved this study. A verbal consent was taken from all the participants in this study.

Setting

The study was conducted in the Nuclear Medicine Department from the January 2021 to July 2021.

Study design

A descriptive cross-sectional study design was adopted in order to achieve the objectives of the present study.

Data collection

A questionnaire form was used in order to collect all the relevant information related to the study. The questionnaire form included information in regard to: name, age and gender; symptoms, signs, laboratory tests done (TSH, T3, T4), imaging studies performed used (neck ultrasound, thyroid scan, Fine-Needle Aspiration Biopsy (FNAB), and thyroid lobectomy); type of cancer, and staging ; type of surgery, Radioactive Iodine Therapy (RAI), hormonal therapy, chemotherapy and radiotherapy; side effects or complication; DXWBS, CXR, CT, MRI and PET scan.

Statistical analysis

Study data were collected and processed using electronic data from the statistical analysis was performed using SPSS v24. Data were reported as means and standard deviations for ordinal variables or frequencies and percentages for categorical variables. The correlation coefficient of Pearson Chi-Square, and Fisher's Exact test were used to evaluate the strength of the association. A P-value of less than 0.05 was considered statistically significant.

RESULTS

Patients demographic data analysis

A total of 213 patients (175 females and 38 males) with mean age (41.6 ± 13.2) years. In relation to gender, males were (38, 17.8%), whereas females were (175, 82.2%).

Treatment modalities data analysis

The majority of patients undergoing total thyroidectomy in 164(77%) of patients, followed by near total thyroidectomy in 39(18.3%), subtotal thyroidectomy in 7(3.35%), and 3(1.4%) patients treated by semi thyroidectomy with no significant difference (p-value=0.26), as showed in (Table 1).

Tab. 1. Patients distribution according to the type of surgery performed

Surgery	No.	%	P –value*
Total thyroidectomy	164	77	0.26
Semi thyroidectomy	3	1.4	
Subtotal thyroidectomy	7	3.3	
Near total thyroidectomy	39	18.3	

Total	213	100	

*Chi square was used to estimate p-value

The most common complication of surgery of thyroid cancer recorded in this study was thyroid insufficiency in 146(68.5%) of patients. Other complication were parathyroid insufficiency (hypocalcemis) in 12.2%, hypertrophic scar in 4.7%, and infection and HOV/ Strider in 0.5% for each. In addition, 29(13.6%) of patients presented with more than one complication with no significant difference (p-value= 0.097), as showed in (Table 2).

Tab. 2. Patients distribution according to complications of surgery

Surgery	No.	%	P –value*
Infection	1	0.5	0.097
HOV/ Strider (RLN injury)	1	0.5	
Thyroid insufficiency (hormone replacement)	146	68.5	
Parathyroid insufficiency (hypocalcemis)	26	12.2	
Hypertrophic scar	10	4.7	
More than one	29	13.6	
Total	213	100	

*Chi square was used to estimate p-value

Radioactive Iodine therapy

Approximately, 191/213 (89.7%) of patients received RAI as diagnostic or therapeutic doses, while 22(10.3%) hadn't received with no significant difference (p-value=0.1), as showed in (Table 3).

Tab. 3. Patients distribution according to the RAI

RAI	No.	%	P –value*
Yes	191	89.7	0.1
No	22	10.3	
Total	213	100	

*Chi square was used to estimate p-value

Salivary gland swelling / pain was the most common side effect documented beyond RAI administration in 16(7.5%). Nausea was recorded in 5.2%, taste alteration in 1.9%, and bone marrow suppression in 0.9%. About 32(15%) of patients described more than one of side effect. In addition, 148/213 (69.5%) of patients didn't shown any side effect with no significant difference (p-value=0.14), as showed in (Table 4).

Tab 4. Patients distribution according to the side effects of RAI

Side effects	No.	%	P –value*
Nausea	11	5.2	0.14
Taste alteration	4	1.9	
Salivary gland swelling / pain	16	7.5	
Decrease immunity (bone marrow suppression)	2	0.9	
More than one	32	15	
No side effect	148	69.5	
Total	213	100	

*Chi square was used to estimate p-value

Hormonal Replacement Therapy (HRT) (TSH-suppression therapy)

Nearly all patients 212(99.5%) received hormonal replacement therapy of synthetic Levothyroxine, and only one patients didn't with no significant difference (p-value=0.72), as showed in (Table 5).

Tab. 5. Patients distribution according to HRT

Hormonal therapy	No.	%	P –value*
Yes	212	99.5	0.72
No	1	0.5	
Total	213	100	

*Chi square was used to estimate p-value

Tachycardia was the most common side effect recorded in 15(7%), followed by tremor in 4.7%, and headache in 3.3%. About 3.8% of patients suffered from different side effect. In addition, 81.2% of patients didn't shown any side effect with no significant difference (p-value=1), as showed in (Table 6).

Tab. 6. Patients distribution according to side effects of HRT

Side effects	No.		%	P –value*
Tachycardia	15		7	1
Headache	7		3.3	
Tremor	10		4.7	
More than one	8		3.8	
No side effect	173		81.2	
Total	213		100	

*Chi square was used to estimate p-value

Chemotherapy

Only one patients with ATC received chemotherapy and showed different side effect with no significant difference (p-value=NA), as showed in (Table 7 and 8).

Tab. 7. Patients distribution according to chemotherapy

Chemotherapy	No.	%	P –value*
Yes	1	0.5	NA
No	212	99.5	
Total	213	100	

*Chi square was used to estimate p-value

Tab. 8. Patients distribution according to side effects of chemotherapy

Side effects	No.	%	P –value*
Nausea	-	-	NA
Vomiting	-	-	
Hair-loss	-	-	
Skin dryness	-	-	
Bone marrow suppression	-	-	
More than one	1	0.5	

No	212	99.5	
Total	213	100	

*Chi square was used to estimate p-value

EBRT

Only one patients with ATC received EBRT, and he didn't completed the fractions of radiotherapy and this is with no significant difference (p-value=NA), as showed in (Table 9).

Tab. 9. Patients distribution according to the EBRT

EBRT	No.	%	P –value*
Yes	1	0.5	NA
No	212	99.5	
Total	213	100	

*Chi square was used to estimate p-value

Normal laboratory tests were documented in 134(62.9%) of patients. While 7% of patients showed increased in TSH, 13.6% showed increased in S.T.g, 9.9% showed increased in Tg Ab and 2.3% showed increased in S Ca^{+2}. In addition, seven patients (3.3%) showed increased in more than one test with no significant difference (p-value=0.78), as showed in (Table 10).

Tab. 10. Patients distribution according to laboratory tests on follow-up

Test	No.	%	P –value*
TSH (increase)	15	7	0.78
T3 (increase)	1	0.5	
T4 (increase)	1	0.5	
S.T.g (increase)	29	13.6	
Tg AB (increase)	21	9.9	
S Ca^{+2} (increase)	5	2.3	
Normal	134	62.9	
More than one (increase)	7	3.3	
Total	213	100	

*Chi square was used to estimate p-value

The normal ultrasound found in 89(41.8%) of patients, whereas 59(27.7%) of patients showed remnant thyroid tissue. 49/213 (23%) revealed LAP in ultrasound. About 3.3% of ultrasound showed secondary metastasis with a significant difference (p-value= 0.05), as showed in (Table 11).

Tab. 11. Patients distribution according to ultrasound study on follow-up

Ultrasound	No.	%	P –value*
Normal	89	41.8	0.05
Remnant thyroid tissue	59	27.7	
LAP	49	23	
Metastasis	7	3.3	
Not done	9	4.5	
Total	213	100	

*Chi square was used to estimate p-value

Regarding DXWBS on follow-up, 53(24.9%) of patients showed recurrence or relapse, whereas 4(1.9%) showed secondary metastasis. CXR showed distant metastasis in 11(5.2%) of patients. About 14(6.5%) of patients showed recurrence on CT scan of head and neck, and one patient (0.5%) showed distant metastasis. MRI revealed recurrence in 5(2.3%) of patients, and PET scan showed recurrence in one patient (0.5%), as shown in (Tables 12).

Tab. 12. Patients distribution according to imaging on follow-up

Imaging	Relapse	No.	%	P –value*
DX WBS	Recurrence	53	24.9	0.059
	Metastasis	4	1.9	
	Not done	156	73.2	
CXR	Metastasis	11	5.2	0.6
	Not done	202	94.8	
CT scan	Recurrence	14	6.5	0.07
	Metastasis	1	0.5	
	Not done	198	93	
MRI	Recurrence	5	2.3	0.73
	Not done	208	97.7	
PET scan	Recurrence	1	0.5	NA
	Not done	212	99.5	
	Total	213	100	

*Fisher's Exact test was used to estimate p-value

DISCUSSION

The mean age of cases in this study was 41.6 years ± 13.2 years. This is agree with that documented by Hamid, and Abdul Jabbar in Baghdad city. Also, AL-Atrooshi agree with us, they studied 489 cases of thyroid cancer with age range between 15 years - 68 years and median of 41.5 years [34-36]. This could be explained by that thyroid cancer cases started to pick up by the thirties and continue to increase with advanced age [37]. In this study regarding to gender, we revealed that females were predominant with M:F ratio reached to 1:4.6. Most of previous studies recorded similar findings like [34-36].

In regarding to surgical operations in this study, the majority of patients in underwent total thyroidectomy in 77%, followed by near total thyroidectomy, and subtotal thyroidectomy. The most common complication of surgery of thyroid cancer recorded in this study was thyroid insufficiency in 68.5% of patients. Other complication were parathyroid insufficiency (hypocalcemis), hypertrophic scar, infection and HOV/ Strider. These are in consistent with findings of AL-Atrooshi et al., which mentioned that 16/28 cases of PTC found in total thyroidectomy 7/28 cases in subtotal thyroidectomy, 4/28 cases in near total thyroidectomy and 1/28 case in lobectomy, with no significant statistical correlation was found between prevalence of PTC and type of surgery [36]. Another agreement study with us is a study of Hamid et al., which performed surgical procedure out of 402 patients, 284 patients underwent total thyroidectomy (70.6%) and 98 patients near total thyroidectomy (24.4%) while the remaining 20 cases were operated as hemi-thyroidectomy (10 cases) and subtotal thyroidectomy (10 cases) which represent 2.5% each [34]. They listed the postoperative complications (recurrent laryngeal nerve palsy and hypocalcaemia, hematoma, tracheostomy and wound infection) in 116 patients (28.8%) included: temporary change in voice in 25 patients (6.2%), permanent unilateral recurrent nerve palsy in four patients (1%), transient symptomatic

hypocalcemia in 80 patients (19.9%), permanent hypocalcemia in four patients (1%), hematoma and bleeding in five cases (1.2%), and wound infection was recorded in three patients (0.7%), these list of complication seemed to be similar to that reported by this study in some situation. While Abdul Jabbar, recorded different data from that reported by this study, they listed different percent of surgical procedures performed included: 47 near total thyroidectomy (49.5%), 34 total thyroidectomy (35.8%) and 11 total lobectomy and isthmusectomy (11.6%), 3 subtotal thyroidectomy (3.1%). They documented recurrent laryngeal nerve palsy and hypocalcaemia in 14 patients (14.7%) [35]. These discrepancies could be explained by that the radical operations is recommended for the management of thyroid cancer in which the primary tumor measure ≥ 1.0 cm to 2.0 cm, and because of the high percentage (42.7%) of the multifocal distribution of thyroid cancer, removing the thyroid gland in its entirety reduce the chance for malignancy in the residual parenchyma [38]. It also allow for the correct risk assessment of the tumor, which is based on size and extracapsular infiltration [12, 18, 38]. In addition, thyroidectomy is also recommended because 5%-10% of thyroid cancer recurrences are found in the contralateral lobe [38]. Studies also show the cost-effectiveness of an initial total thyroidectomy for nodules that are suspicious for cancer based on a FNAB versus initial lobectomy and intraoperative frozen section procedure [39].

A comparison study done in Saudi Arabia, all patients underwent total or near total thyroidectomy without any difference between children and adults. However, because of palpable or radiological visible lymph nodes, the neck dissection was attempted more in children than those in other age groups (88.9% vs. 67.9% vs. 71.2%). And post-thyroidectomy complication rates were minimal; however, permanent hypocalcemia was statistically and significantly high in children and young adults (P=0.043) [40]. Furthermore, complications are not completely irreversible, the incidence of hypocalcemia can be reduced by starting oral supplementation of calcium plus vitamin D one week pre surgery, and continued for 2 weeks postoperative. In cases of hypo-parathyroid hormone levels, oral calcitriol is also added to increase the absorption of calcium. The prevention of recurrent laryngeal nerve injury is dependent on preoperative and intraoperative measures by examined of patient for any preexisting laryngeal dysfunctions. Intra-operatively, careful dissection of the nerve, nerve monitoring, and the choice of hemostatic techniques are important [38].

Regarding RAI administration in this study, out of 213, 191(89.7%) of patients received RAI with no significant difference between groups (p-value=0.1). Beyond RAI therapy, patients complicated with salivary gland swelling in 7.5%, nausea in 5.2%, taste alteration in 1.9%, and bone marrow suppression in 0.9%. These data were in consistent with the most guidelines applied in world like [13-15]. There are several reasons to used RAI, the first one is the ^{131}I has had an important role in the management of thyroid cancer since forty of previous century [13-17, 41]. The second one is the RAI use in coordination following thyroidectomy to completely ablation the thyroid tissues and to postoperatively eradication of residual cancer [13-15]. In term of management, guidelines from the American Thyroid Association recommend ^{131}I ablation for known metastases, extrathyroidal extension, and tumor size>4 cm; or smaller tumors with high-risk features, such as vascular invasion and aggressive histologies [12, 18]. Besides, the guidelines don't recommend ablation for unifocal or multifocal tumors <1 cm without high-risk features [12]. Nguyen, concluded that total thyroidectomy increase survival rates and decreases recurrence rates in patients and RAI has been an integral adjuvant role in the treatment of TC [42]. Iyer et al., supported findings of this study, which mentioned that the patient's general health status and treatment tolerability are important considerations because side effects are common with ^{131}I therapy which include salivary gland dysfunction (>40%), abnormally dry eyes (25%), transient fertility reduction (20%), transient leukopenia, and thrombocytopenia [43]. RAI is absolutely contraindications in pregnancy and breastfeeding, because it can interfere with a fetus's thyroid gland and cause a severe physical and mental underdevelopment condition known as cretinism [5, 12, 15]. Other relative

contraindications are bone marrow depression, pulmonary function restriction, salivary gland dysfunction, and some neurologic disorders [41].

In regarding to HRT in this study, all patients in this study received hormonal replacement therapy of synthetic Levothyroxine. According to the complication development in this study, only 15 cases showed tachycardia, 10 cases showed tremor, and 7 patients complained of headache. These were similar with a study on HRT, that prescribed in most patients in the study of Hamid, (> 50%) following more limited thyroid resection (i.e., lobectomy or subtotal thyroidectomy), thereby eliminating the theoretical advantage of less radical thyroid surgery [44-45]. This is because of that HRT is recommended post-surgery and post-RAI, because DTC express TSH receptors that respond to hormones stimulation [5, 6]. Exactly, one year after ablation, a single rhTSH-stimulated S.T.g measuring <0.5 ng/mL without Tg Ab can identify patients who are completely free of tumor [46].

In this study, only one case of ATC received chemotherapy and radiotherapy. Complete surgical excision of ATC is the goal of initial therapy, however, surgery should be avoided when complete excision is not possible. There is no therapeutic role for RAI in ATC. The great majority of patients with ATC have poor performance status and locally advanced status. Patients with a good performance status and no evidence of metastases should be offered aggressive treatment with maximum safe resection and EBRT, with or without concurrent chemotherapy [18].

CONCLUSION

The radical surgery as total thyroidectomy and near total thyroidectomy are better approaches to decrease recurrence, increase survival and good prognosis. RAI and hormonal replacement therapy are better adjuvant therapy for patients with thyroid cancer after surgery. Further studies specially large prospective ones will enhance a more advance and different approach for studying thyroid cancer regarding trends, diagnosis and treatment in different Iraqi provinces. Enhancing the knowledge and the role of family physicians in primary health centers about patients with thyroid cancer and proper referral of them. Directing future researches to focus on establishing strategies for developing high-quality, team-based care for increasing long term surveillance of patients with thyroid cancer. A well designed model between primary health care facilities and Nuclear Medicine Departments to define specific role of each member and allows proper management, referral and follow-up of thyroid cancer patients.

DISCLOSER

None

REFERENCES

1. Maxwell C, Sipos JA. In: Cooper DS and Sipos JA (editors). Medical management of Thyroid Diseases: Differentiated thyroid carcinoma, Introduction. 3rd edt. NY, USA. CRC Press, Taylor & Francis Group, LLC. 2019:181.
2. Iniguez-Ariza NM , Brito JP. In: Gunderson and Tepper (editors). Clinical Radiation Oncology: Thyroid Cancer, overview. 4th edt Netherlands, Elsevier, Inc. 2016; 742-760.
3. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2018. CA: cancer j clin. 2018;68:7-30.
4. WHO. The Global Cancer Observatory. Iraq rep.
5. Haugen BR. 2015 American Thyroid Association management guidelines for adult patients with thyroid nodules and differentiated thyroid cancer: what is new and what has changed?. Cancer. 2017;123:372-381.
6. Smallridge RC, Ain KB, Asa SL, Bible KC, Brierley JD, et al. American Thyroid Association guidelines for management of patients with anaplastic thyroid cancer. Thyroid. 2012;22:1104-1139.
7. Volante M, Collini P, Nikiforov YE, Sakamoto A, Kakudo K, et al. Poorly differentiated thyroid carcinoma: the Turin proposal for the use of uniform diagnostic criteria and an algorithmic diagnostic approach. Am j surg pathol. 2007;31:1256-1264.
8. Lim H, Devesa SS, Sosa JA, Check D, Kitahara CM. Trends in thyroid cancer incidence and mortality in the United States, 1974-2013. Jama. 2017;317:1338-1348.
9. Grani G, Lamartina L, Durante C, Filetti S, Cooper DS. Follicular thyroid cancer and Hürthle cell carcinoma: challenges in diagnosis, treatment, and clinical management. Lancet Diabetes Endocrinol. 2018;6:500-514.
10. Hu MI, Ying AK, Jimenez C. Update on medullary thyroid cancer. Endocrinol. Metab. Clin. 2014;43:423-42.
11. Papini E, Guglielmi R, Bianchini A, Crescenzi A, Taccogna S, et al. Risk of malignancy in nonpalpable thyroid nodules: predictive value of ultrasound and color-Doppler features. J. Clin. Endocrinol. Metab. 2002;87:1941-1946.
12. Prasongsook N, Kumar A, Chintakuntlawar AV, Foote RL, Kasperbauer J, et al. Survival in response to multimodal therapy in anaplastic thyroid cancer. The J. Clin Endocrinol Metab. 2017;102:4506-4514.
13. Famakinwa OM, Roman SA, Wang TS, Sosa JA. ATA practice guidelines for the treatment of differentiated thyroid cancer: were they followed in the United States?. Am. j. surg., 2010;19:189-198.
14. Hay ID. Selective use of radioactive iodine in the postoperative management of patients with papillary and follicular thyroid carcinoma. J. surg. oncol. 2006;94:692-700.
15. Sacks W, Fung CH, Chang JT, Waxman A, Braunstein GD. The effectiveness of radioactive iodine for treatment of low-risk thyroid cancer: a systematic analysis of the peer-reviewed literature from 1966 to April 2008. Thyroid. 2010;20:1235-1245.
16. Sawka AM, Brierley JD, Tsang RW, Thabane L, Rotstein L,et al. An updated systematic review and commentary examining the effectiveness of radioactive iodine remnant ablation in well-differentiated thyroid cancer. Endocrinol. metab. clin. N. Am.. 2008;37:457-480.
17. Lamartina L, Durante C, Filetti S, Cooper DS. Low-risk differentiated thyroid cancer and radioiodine remnant ablation: a systematic review of the literature. J. Clin. Endocrinol. Metab.12;100:1748-1761.
18. Sawka AM, Thephamongkhol K, Brouwers M, Thabane L, Browman G, et al. A systematic review and metaanalysis of the effectiveness of radioactive iodine remnant ablation for well-differentiated thyroid cancer. J. Clin. Endocrinol. Metab. 2004;89:3668-3676.
19. NCCN. Clinical Practice Guidelines in Oncology. updated Version.2.
20. Biermann M, Pixberg MK, Schuck A, Willich N, Heinecke A, et al. External beam radiotherapy. InThyroid cancer 2005 (pp. 139-161). Berlin, Heidelberg: Springer Berlin Heidelberg.
21. Toraih EA, Fawzy MS, Ning B, Zerfaoui M, Errami Y, et a;. A miRNA-based prognostic model to trace thyroid cancer recurrence. Cancers. 2022;14:4128.
22. Ask A, Bjork-Eriksson T, Zackrisson B, Blomquist E, Glimelius B. The potential of proton beam radiation therapy in head and neck cancer. Acta Oncol. 2005;1;44:876-880.
23. Rosenbluth BD, Serrano V, Happersett L, Shaha AR, Tuttle RM, et al. Intensity-modulated radiation therapy for the treatment of nonanaplastic thyroid cancer. Int. J. Radiat. Oncol.* Biol.* Physics. 2005 ;63:1419-1426.
24. Schwartz DL, Lobo MJ, Ang KK, Morrison WH, Rosenthal DI, et al. Postoperative external beam radiotherapy for differentiated thyroid cancer: outcomes and morbidity with conformal treatment. Int. J. Radiat. Oncol.* Biol.* Phys. 2009;74:1083-1091.
25. Kim JH, Kim MS, Yoo SY, Lim SM, Lee GH, et al. Stereotactic body radiotherapy for refractory cervical lymph node recurrence of nonanaplastic thyroid cancer. Otolaryngology—Head and Neck Surgery. 2010;142:338-343.
26. Liu H, Yang D, Li L, Tu Y, Chen C, et al. Appraisal of radioiodine refractory thyroid cancer: advances and challenges. Am. J. Cancer Res. 2020;10:1923.
27. Crouzeix G, Michels JJ, Sevin E, Aide N, Vaur D, et al. Unusual short-term complete response to two regimens of cytotoxic chemotherapy in a patient with poorly differentiated thyroid carcinoma. J. Clin. Endocrinol. Metab. 2012;97:3046-3050.
28. Schlumberger M, Tahara M, Wirth LJ, Robinson B, Brose MS, et al. Lenvatinib versus placebo in radioiodine-refractory thyroid cancer. N. Engl. J. Med. 2015;372:621-630.
29. Wells Jr SA, Robinson BG, Gagel RF, Dralle H, Fagin JA, et al. Vandetanib in patients with locally advanced or metastatic medullary thyroid cancer: a randomized, double-blind phase III trial. J. clin. oncol. 2012;30:134.
30. Elisei R, Schlumberger MJ, Muller SP, Schoffski P, Brose MS, et al. Cabozantinib in progressive medullary thyroid cancer. J. clin. oncol. 2013;31:3639.
31. Bible KC, Suman VJ, Molina JR, Smallridge RC, Maples WJ, et al. Efficacy of pazopanib in progressive, radioiodine-refractory, metastatic differentiated thyroid cancers: results of a phase 2 consortium study. The lancet oncology. 2010;11:962-972.
32. Bible KC, Suman VJ, Molina JR, Smallridge RC, Maples WJ, et al. A multicenter phase 2 trial of pazopanib in metastatic and progressive medullary thyroid carcinoma: MC057H. J. Clin. Endocrinol. Metab. 2014;99:1687-1693.
33. Subbiah V, Kreitman RJ, Wainberg ZA, Cho JY, Schellens JH, et al. Dabrafenib and trametinib treatment in patients with locally advanced or metastatic BRAF V600–mutant anaplastic thyroid cancer. J. Clin. Oncol. 2018;36:7.
34. Sulaiman TI, Hamid LS, AbdulJabbar MQ. Incidental thyroid carcinoma in patients treated surgically for thyroid disease. J. Fac. Med. Baghdad, 2019;61(2):60-67.
35. Nanjappa N, Kumar A, Swain SK, Aroul TT, Smile SR, et al. Incidental thyroid carcinoma. Indian J. Otolaryngol. Head Neck Surg. 2013;65:37-39.
36. Al-Atrooshi SA, Ibraheem NH, Yahya TT. The Prevalence of Papillary Thyroid Microcarcinoma in 489 Cases of Thyroidectomy in Iraqi Patients. Iraqi Postgrad. Med. J. 2017;16:151-8.
37. Mulatu B, Michael Y, Alemu S, Demissie WR. Pattern of Thyroid Cancer and Its Associated Factors Among Thyroid Patients Underwent Thyroidectomy at Jimma Medical Center, Southwest Ethiopia; A Four Years Retrospective Review.
38. Lucchini R, Monacelli M, Santoprete S, Triola R, Conti C, et al. Differentiated thyroid tumors: surgical indications. g. chir. 2013;34:153.
39. Leiker AJ, Yen TW, Cheung K, Evans DB, Wang TS. Cost analysis of thyroid lobectomy and intraoperative frozen section versus total thyroidectomy in patients with a cytologic diagnosis of “suspicious for papillary thyroid cancer”. Surgery. 2013;154:1307-1314.
40. Al-Qahtani KH, Tunio MA, Al Asiri M, Aljohani NJ, Bayoumi Y, et al. Clinicopathological features and treatment outcomes of differentiated thyroid cancer in Saudi children and adults. J. Otolaryngol.-Head Neck Surg. 2015;44:1-6.
41. Wartofsky L, Van Nostrand D. Radioiodine treatment of well-differentiated thyroid cancer. Endocrine. 2012;42:506-513.

42. Nguyen QT, Lee EJ, Huang MG, Park YI, Khullar A, et al. Diagnosis and treatment of patients with thyroid cancer. Am. health drug benefits. 2015;8:30.
43. Iyer NG, Morris LG, Tuttle RM, Shaha AR, Ganly I. Rising incidence of second cancers in patients with low-risk (T1N0) thyroid cancer who receive radioactive iodine therapy. Cancer. 2011;117:4439-4446.
44. Giles Y, Boztepe H, Terzioglu T, Tezelman S. The advantage of total thyroidectomy to avoid reoperation for incidental thyroid cancer in multinodular goiter. Arch. Surg., 2004;139:179-182.
45. Bradly DP, Reddy V, Prinz RA, Gattuso P. Incidental papillary carcinoma in patients treated surgically for benign thyroid diseases. Surgery. 2009;146:1099-1104.
46. Lin YS, Wu HY, Yu MC, Hsu CC, Chao TC. Patient outcomes following surgical management of multinodular goiter: Does multinodularity increase the risk of thyroid malignancy?. Medicine. 2016;95.