REVIEW ARTICLE

Translational Health Reports. 2025;1(1): 4
https://doi.org/10.22034/thr.2025.213077

Unraveling the Spectrum of Thyroid Carcinoma Surgery: From Aggressive Anaplastic to Curable Differentiated Forms: A Comprehensive Narrative Review

Rostam Poormousa[1], Mehran Frouzanian[2], Amirsaleh Abdollahi[2], Mohamad Javad Bay[3], Kasra Hasannejad[2], Reza Talaei[2]

[1]Department of Otolaryngology, School of Medicine, Mazandaran University of Medical Sciences, Sari, Iran
[2]Student Research Center, School of Medicine, Mazandaran University of Medical Sciences, Sari, Mazandaran, Iran
[3]Medical Student Mazandaran University of Medical Sciences, Sari,Mazandaran, Iran

Article history:

Received: 14 Dec 2024
Accepted: 28 Dec 2024
Available online: 28 Jan 2025

Keywords:

Thyroid carcinoma
Anaplastic thyroid carcinoma (ATC)
Papillary thyroid carcinoma (PTC)
Hurthle cell carcinoma (HCC)
Medullary thyroid carcinoma (MTC)
Pain management
Multimodal approach

Abstract

Thyroid carcinoma encompasses a spectrum of malignancies with distinct clinical characteristics, management strategies, and prognoses. This narrative review article provides an in-depth examination of anaplastic thyroid carcinoma (ATC), papillary thyroid carcinoma (PTC), Hurthle cell carcinoma (HCC), and medullary thyroid carcinoma (MTC), offering insights into their epidemiology, diagnostic and treatment modalities.

Anaplastic thyroid carcinoma is a highly aggressive and undifferentiated form of thyroid cancer, often associated with poor prognosis. Treatment strategies include combined resection and radiotherapy, but late-stage cases exhibit limited therapeutic options, emphasizing the need for novel therapeutic approaches. Papillary thyroid carcinoma, the most common thyroid cancer, generally carries a favorable prognosis. The article discusses surgical interventions like total thyroidectomy and lobectomy, along with minimally invasive techniques such as transoral endoscopic thyroidectomy vestibular approach (TOETVA) and robotic thyroidectomy. The importance of considering health-related quality of life in the treatment decision-making process is highlighted. Hurthle cell carcinoma, a rare and aggressive subtype, is explored with a focus on factors influencing prognosis. Surgical management, including thyroid lobectomy, completion thyroidectomy, and iodine-131 therapy, is discussed in detail. Medullary thyroid carcinoma is categorized into hereditary and sporadic forms, each requiring specific approaches. The review emphasizes the significance of genetic testing for patients at risk of multiple endocrine neoplasia syndrome (MEN2) and the need for early thyroidectomy in genetic RET mutation carriers. Expanding beyond conventional topics, the review integrates an in-depth analysis of pain management post-thyroid surgeries. Recognizing the nuanced nature of pain in thyroid carcinoma patients, a multimodal approach is advocated, encompassing pharmacological interventions, such as NSAIDs and opioids, as well as non-pharmacological methods. Emphasis is placed on individualized care, considering patient experiences and health-related quality of life. Furthermore, the article evaluates the extent of surgery, the role of radioiodine therapy, and the significance of follow-up in treating differentiated thyroid carcinomas (DTC). Surgical approaches for follicular thyroid carcinoma (FTC) and factors influencing the decision for total thyroidectomy versus lobectomy are elaborated upon. In summary, this narrative review provides a comprehensive overview of thyroid carcinoma subtypes, their epidemiology, surgical interventions, and postoperative management, offering valuable insights for clinicians and researchers in the field.

Cite this article as: Poormousa R, Frouzanian M, Abdollahi A , Javad Bay M, Hasannejad K, Talaei R. Unraveling the Spectrum of Thyroid Carcinoma Surgery: From Aggressive Anaplastic to Curable Differentiated Forms: A Comprehensive Narrative Review. Transl Health Rep. 2025;1(1):4. https://doi.org/10.22034/thr.2025.213077.

Correspondence:
Amirsaleh Abdollahi
Medical Student, Mazandaran University of Medical Sciences, Sari,Mazandaran, Iran. Tell: +989120202284
E-mail: amirsalehabdellahi@gmail.com

Introduction

Anaplastic thyroid carcinoma (ATC) is an extremely aggressive and undifferentiated form of thyroid cancer, ranking as one of the most lethal diseases globally, accounting for 40% of all thyroid cancer-related deaths. In contrast, papillary thyroid carcinoma (PTC) is generally a highly treatable tumor, although some patients may experience recurrences, warranting treatment through surgical procedures and 131 Iodine therapy. The unique Hurthle cell, also known as oxyphilic cell, is distinguishable by its abundance of mitochondria, rendering it a vivid and acidophilic entity when observed under a microscope. HCC does not have a poorer prognosis than ordinary Follicular Thyroid Carcinoma. Medullary thyroid carcinoma (MTC) represents a rare and exceptionally aggressive thyroid tumor, proving more challenging to cure compared to papillary thyroid carcinoma. MTC originates from parafollicular cells, which derive from the neural crest and are known to secrete calcitonin and various other peptides. Grouped under the umbrella term of "differentiated thyroid carcinoma (DTC)" are papillary thyroid carcinoma (PTC) and follicular thyroid carcinoma (FTC).(1-7)

Patients who develop bone metastases from thyroid cancers typically experience a more favorable prognosis, with 10-year survival rates falling within the range of 13% to 21%, in contrast to some other primary carcinomas that more commonly spread to the bones .(8)

In the case of thyroid carcinoma, the surgeon must remove all neoplastic tissue in the neck, including the thyroid gland, affected lymph nodes, and/or soft tissue (9). There are three main types of thyroid surgery:

- total thyroidectomy (the removal of the entire thyroid gland)
- lobectomy or hemithyroidectomy (the removal of half of the thyroid gland)
- subtotal thyroidectomy (the surgical removal of the entire gland except for a small portion on the less affected side)

that portion not removed in subtotal thyroidectomy is near the parathyroid glands and the recurrent laryngeal nerve. Therefore, this procedure helps prevent injury to these structures. However, in some poor-prognosis patients, total thyroidectomy may be preferable because it lowers the risk of recurrence and facilitates the patient's follow-up (10, 11) (12). According to the guidelines of the American Thyroid Association, thyroidectomy should be performed for patients with a diameter >2 cm (without lymph node dissection). According to the National Comprehensive Cancer Network (NCCN) guidelines, total thyroidectomy (without lymph node dissection) should be performed in people over 45 or under 15 years old. The Chinese guidelines are different from the previous two guidelines and recommend thyroid surgery along with central lymph node dissection for all patients to avoid laryngeal nerve and parathyroid involvement. (13)

Anaplastic thyroid carcinoma (ATC):

Epidemiologically, ATC is higher in endemic goiter regions. The Frequency in females has a higher rate than in males, and the range of patients' ages is between 60 to 70 years. Actually, papillary thyroid carcinoma (and follicular) can transform into an anaplastic tumor by long time duration and T53 gene inactivation. In the microscopic view increasing in mitosis, an infiltrative growth pattern, and vascular invasion can be seen.(1)

In a documented case study, an uncommon occurrence of nasal tip metastasis in anaplastic thyroid carcinoma is reported, featuring a particularly intriguing mode of spread. The unique mechanism involved the local self-implantation of malignant cells, a phenomenon that had not been previously documented in the medical literature.(14)

Treatment:

One year and two years survival rates are 48% & 26% for the patients. Combined Resection (thyroidectomy + cervical lymph node resection if the tumor involves it) with radiotherapy may be useful to increase survival in stage IVA & IVB, but IVC stage due to distant metastasis have a poor prognosis, so there is no obvious difference between surgical or non-surgical methods in this stage).(1)

According to the Wächter et all the median survival in stage IVA/IVB with multimodal therapy (thyroidectomy (TTX) +Lymphadenectomy (LAD) +External beam radiation (EBRT)) is higher than surgical therapy (6-79 months > 1-8 months in debulking/tracheostomy).(15)

Papillary thyroid carcinoma (PTC):

Mostly, PTC is seen as a single nodule; however, with invasion to the lymphatic paratracheal chain, it can spread within the thyroid gland and causes multifocal tumor formation. If there were no evidence of recurrence or distant metastasis, survival would be at a high rate. If the nodule diameter is at a maximum rate <1 cm2, called papillary thyroid microcarcinoma, that has a good prognosis with a long survival (10-year survival>90%).(2, 16)

Treatment:

The common treatment for PTMC is procedures like total thyroidectomy (TT) and unilateral lobectomy (LT). Because of its long survival, physicians should consider the other parameter named "health-related quality of life (HRQoL). Briefly, LT has more benefits than TT for patients. (TT makes more problems like restriction on

daily activities, more scars in some patients, and lower scores in mental/physical health). (16)

Open thyroidectomy (OT) is a standard procedure to treat thyroid carcinoma, but the complication of postoperative neck scar can decrease young women's self-confidence. In other hand, surgeons can use a scarless procedure called transoral endoscopic thyroidectomy vestibular approach (TOETVA) that makes easy access and a short distance to the thyroid gland. In TOETVA, Surgeon can't remove a thyroid nodule with a diameter higher than 3 cm (with extending central incision can be 3.5 cm). There's a higher risk of infection and probability of mental nerve injury in this procedure. Generally, TOETVA has benefits for selective patients with low-risk or papillary thyroid microcarcinoma. (17)

Another procedure that can avoid specious neck scars is a robotic thyroidectomy. For OT, the surgeon uses a 4-6 cm transverse incision to access the thyroid. Still, bilateral axillary-breast approach robotic thyroidectomy (BABA RT) requires two 8 mm axillary incisions + two pre-areolar incisions 8 & 12 mm on the left & right. This procedure facilitates visualization of the parathyroid gland and recurrent laryngeal nerve. Mostly, BABA RT is used for the treatment of tumors with a diameter<2 cm or a diameter between 2-4 cm without lymph node metastasis. (18)

Although differentiated PTC grows slowly, depending on the genomic evolution, the tumor has the ability to metastasize to distant lymph nodes. Based on the Wu Z et all" in which 2108 PTC cases underwent surgery, the average metastasis was 57.23%, and this metastasis is correlated with the diameter of the tumor (in diameter > 2 cm, the probability of metastasis increases by 77.53%). In this article, 2 operation models of Surgery have been performed on the patients: 1- Total thyroidectomy + central lymph node dissection and 2- Total thyroid dissection + central and cervical lymph node dissection. Performing preventive lateral neck lymph node dissection increases the risk of shoulder syndrome, but it is recommended for PTC with a diameter > 1 cm to prevent metastasis. (13)

Cervical nodal metastasis is a frequent occurrence in papillary thyroid cancer. The presence of such metastases is linked to higher recurrence rates and the potential for reduced survival. Detecting these central and lateral neck nodal metastases before surgery through clinical examination and cervical ultrasound is crucial for determining the most appropriate initial surgical approach.

The terms "level VI neck dissection" and "central neck dissection" are often used interchangeably to describe the surgical removal of all lymph nodes in the region extending from the hyoid bone to the sternal notch between the carotid arteries. However, it's important to note that central neck dissection should also encompass the superior mediastinal lymph nodes in compartment VII.

For patients with preoperatively or intraoperatively detected nodal involvement, therapeutic central neck dissection is recommended due to its positive impact on recurrence rates and survival. However, the topic of prophylactic central neck dissection for patients without detectable nodal disease remains contentious. There is no definitive evidence supporting improved recurrence rates or survival with this approach, and it carries the possibility of higher complication rates compared to total thyroidectomy alone.

Reoperative central nodal dissection can be a complex procedure associated with increased complication rates. Nonetheless, in experienced medical centers, it can yield favorable outcomes.(19)

Hurthle cell carcinoma (HCC):

Hurthle cell carcinoma (HCC) is a rare disease with metastasis and poor prognosis. According to most studies, HCC is a subtype of follicular carcinoma. The factors of poor prognosis are age over 45 years, Surveillance, Epidemiology, and End Results , distant(SEER) stage, and late T stage (among stages T1-T4, T4 has the worst prognosis and the least survival). Surgery is the most effective treatment for HCC. (3, 20)

Treatment:

Without any evidence of metastasis, a prior history of neck irradiation, extrathyroidal tumor spread, or involving the contralateral lobe of the thyroid; the surgeon performs thyroid lobectomy and isthmusectomy because only 15-30% of patients have carcinoma. Iodine-131 can remove the remains of the thyroid lobe, which increases the chance of developing anaplastic cancer and prevent reoperation. In patients with minimal invasiveness, especially in the elderly and with tumor size >4 cm, we prefer to perform total thyroidectomy. (21)

During surgery, large central and lateral lymph nodes of the neck should be removed for frozen section examination. Suppose the metastasis of central neck nodes is confirmed. In that case, a central neck dissection should be performed. in this procedure, the surgeon removes paratracheal, perithyroidal, and Delphian lymph nodes from the level of the thyroid cartilage to the sternal notch. (21)

Medullary thyroid carcinoma (MTC):

MTC can be categorized into two main types: hereditary and non-hereditary (sporadic). Hereditary MTC, which accounts for 25% of MTC cases, can be further classified into two subtypes: familial MTC and part of the multiple endocrine neoplasia syndrome type 2 (MEN2), with two distinct forms known as MEN2A or

MEN2B. The general treatment approach for MTC patients centers around surgical intervention. Total thyroidectomy and central neck dissection are the preferred treatments for nearly all MTC patients. Modified radical neck dissection is recommended for patients with lateral lymph node metastases. In cases where individuals are at risk of MEN2 syndromes, genetic testing should be conducted during early childhood. If the test yields a positive result, total thyroidectomy is typically recommended. Total thyroidectomy is also advised for all children with RET mutations. (4)

Table 1. (22).familial and sporadic MTC

Familial MTC	Sporadic MTC
- The root cause of hereditary MTC is activating point mutations in the RET proto-oncogene. - The initial indication of the disease typically presents as C-cell hyperplasia. - Behaves similarly to MEN 2A, and it's hard to differentiate from MEN2A. - Typically occurs in children. - Genetic testing should be conducted during early childhood.	- Most MTCs(about 80%) - Sporadic MTC doesn't initially manifest as C-cell hyperplasia. - Typically appears as a unilateral tumor. - Typically appears tumor in patients aged between their third and fifth decades.

Table 2.(22). Types of MEN2

MEN2A	MEN2B
- more common than MEN 2B - Is characterized by the development of bilateral MTC before the age of 10 . - Usually is characterized by the development of bilateral MTC . - Is recommended to perform prophylactic thyroidectomy before the age of 5 for MEN 2A patients	- Is more aggressive than MEN2A with follicular thyroid carcinoma (FTC) manifesting in the first year of a child's life. - These children are advised to undergo total thyroidectomy within the first six months of life, preferably within the first month. - usually manifests before the age of 20 typically bilateral - early prophylactic or curative thyroidectomy is intended

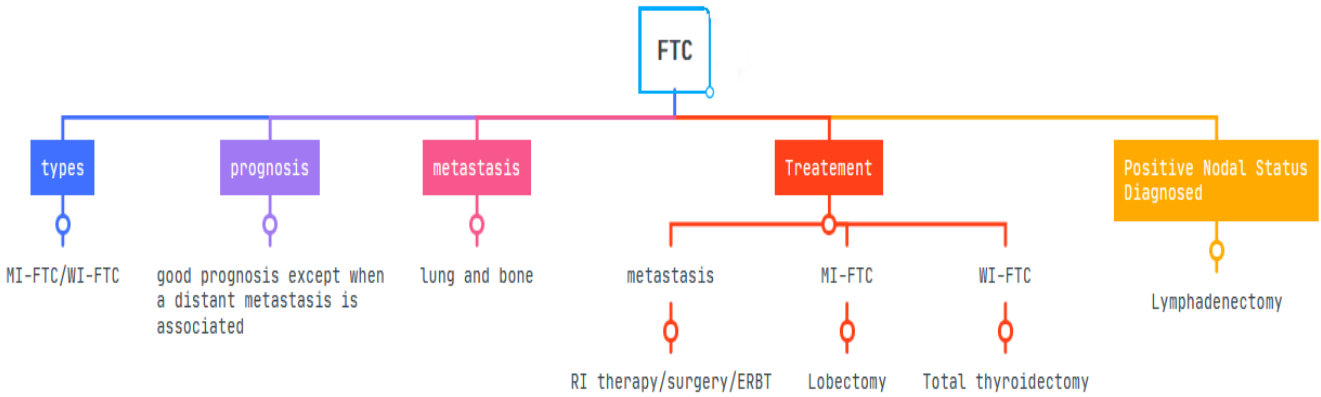

Figure 1. Follicular thyroid carcinoma

Treatment:

Chemotherapy and External-beam radiation therapy are ineffective in the treatment of FTCs. Genetic RET mutation carriers are at risk of hereditary FTC throughout their entire life. Bilateral lateral neck dissection may be done selectively for patients with tumors greater than 1 cm or when the positive nodal status is diagnosed preoperatively using imaging modalities. Total prophylactic thyroidectomy should be performed in at-risk patients before the primary tumor development. But neck dissection is not necessary for them. About half of the patients with MTC will experience recurrence after the initial surgery. The risk of recurrence in MTC patients with negative nodal status is very low. But, in those with positive nodal involvement, the risk of recurrence is pretty high.(23)

In the study Lallier M et.al, 13 patients with a family history of MEN 2 syndromes were treated with total

thyroidectomy and central neck dissection. The study aimed to determine the appropriate age for prophylactic thyroidectomy in gene carriers of MEN 2 syndromes. They suggested that total thyroidectomy should be performed before age five and before the manifestation of C-cell hyperplasia or MTC. They concluded that total thyroidectomy should be the choice for initial treatment in genetic RET mutation carriers with a family history of MEN 2A.(24)

Even though clinical bone metastasis is an infrequent phenomenon in patients with medullary carcinoma, it's essential to acknowledge that it can still happen. Therefore, when assessing individuals with metastatic bone lesions, healthcare providers should include medullary carcinoma in their list of potential differential diagnoses.(25)

Differentiated thyroid carcinoma:

FTC and PTC in comparison to other cancers, these two are highly curable. Still, the risk of recurrence or death from DTC is high in some patients. Therefore, the extent of initial treatment and follow-up should be individualized for every patient based on prognostic indicators (9).

Differentiated thyroid carcinoma has a 10-year overall survival rate of 90% and a cause-specific survival rate of 96% (26).

PTC is more common (80-90% of DTCs) and less aggressive than FTC. Lymph node metastases are more common in PTC. At the same time, hematogenous dissemination and distant metastases are more common in FTC (27-29). Patients with FTC are usually older than PTC patients at the time of diagnosis. (12)

The common treatment strategy in patients with DTC is complete or partial thyroidectomy followed by radioiodine (RI) therapy used for residual and/or metastatic sites. (26) there is controversy in the literature about the extent of initial surgery (12, 26).

Accordin g to Barney BM et all , an unlimited number of 23,605 patients with DTC between 1983 and 2002 have been studied using the Surveillance, Epidemiology, and End Results (SEER) database. They found that although total thyroidectomy offers a slightly better survival rate than lobectomy and near-total thyroidectomy, the difference is not significant, and one should consider the risk of complications of performing a total thyroidectomy (recurrent laryngeal nerve injury and post-operative hypoparathyroidism) before the conducting the operation. However, On the other hand, total thyroidectomy offers a lower probability of cancer recurrence. Therefore, it is suggested that treatment should be individualized for every patient based on the potential risks and advantages of these surgical strategies for the patient. (26)

The combination of percutaneous osteoplasty, which is a minimally invasive procedure, with radioiodine therapy appears to be a highly effective approach for alleviating pain, maintaining bone stability, and enhancing the overall quality of life for patients with differentiated thyroid cancer (DTC) who have bone metastases. It's crucial to emphasize that radioiodine therapy is an essential component of the treatment plan following percutaneous osteoplasty to achieve optimal outcomes.(30)

Sella turcica and petrous bone metastases originating from differentiated thyroid carcinoma are indeed rare occurrences, with only a limited number of documented cases reported so far.(31)

Follicular Thyroid Carcinoma

Two types are minimally invasive (MI-FTC); tumors with ≤3 foci of vascular invasion; and widely invasive (WI-FTC); tumors with >3 principles of vascular invasion (12, 28).

Some well-known prognostic indicators for FTC: are distant metastasis, age (>45 or >60), tumor size (>4 cm), nodal involvement of the tumor, angioinvasion, and capsular invasion (26, 29).

Follicular thyroid carcinoma (FTC) is the second most common thyroid gland cancer. (27) patients with FTC usually have a good prognosis except when a distant metastasis is associated. The most common sites of distant metastasis are the lung and bone. Treatments available for distant metastases are radioactive iodine (RI) therapy, surgery, and external beam radiation therapy (EBRT). for patients with DTC and distant metastasis, the initial treatment can be Total thyroidectomy followed by RI therapy (29).

Lobectomy (hemithyroidectomy) may be done in some patients with MI-FTC sized less than 1 cm without vascular invasion. Also, in some cases where there is a contraindication for total or subtotal thyroidectomy, lobectomy is intended (9, 27, 28).

In the course of postoperative follow-up, if distant metastasis is identified in a patient who has previously undergone hemithyroidectomy, it becomes necessary to perform a second operation known as completion thyroidectomy, which involves the removal of the contralateral lobe in cases where a hemithyroidectomy has already been performed. Additionally, radioactive iodine (RI) therapy may be required. (29, 32).

Some recommend total thyroidectomy for all patients with WI-FTC because it facilitates thyroglobulin testing and RI scanning/treatment during the follow-up and lowers the risk of recurrence. (12)

Lymph node metastases are rare (2-6%), and there's consensus in the literature that prophylactic lymph node dissection is not necessary for patients with FTC

(12, 27, 33). Lymphadenectomy should be performed for therapeutic intent in patients with positive nodal status diagnosed preoperatively or intraoperatively by frozen section analysis (28).

Staubitz JI and colleagues reviewed the treatment strategies for FTCs published by international expert societies ,German Association of Endocrine Surgeons (CAEK) 2013, European Society of Endocrine Surgeons (ESES) 2014, British Thyroid Association (BTA) 2014, and American Thyroid Association (ATA) 2015, based on this study total or near-total thyroidectomy is recommended for all patients with FTC except for some low-risk patients with minimally invasive FTC (capsular invasion only) in the absence of some well-known risk factors (33).

In a study comparing the effectiveness of total thyroidectomy versus lobectomy for the treatment of follicular thyroid microcarcinoma, they found that in the case of follicular thyroid microcarcinoma (≤1 cm), total thyroidectomy does not offer any survival advantage in comparison to lobectomy. However, the physician must rule out the presence of local or distant metastasis before the operation. Total thyroidectomy is intended in the presence of local/distant metastasis (34).

After treating a case with DTC, the patient is always at risk of recurrence. Therefore, follow-up is needed throughout the patient's life (9).

most cases of death related to cancer in FTC patients is when a recurrence of the disease happens. Surgery and 113 iodine therapy can be used to treat recurrences. The extent of the initial surgery in patients with a high risk of recurrence should be total thyroidectomy. After the surgery they should routinely be treated with 113 iodine (9, 12).

A small recurrence can be treated with 113 iodine alone. After three times of failures using 113 iodine therapy, surgery is recommended for the patient (35).

The incidence of metastatic deposits in the skull bones arising from follicular thyroid carcinoma is a rare phenomenon. Even more exceptional is the occurrence where metastatic disease in the skull manifests as the initial symptom without any apparent thyroid abnormalities. In a documented case study, a 60-year-old female patient exhibited a mass in the frontal region of her skull. Following this presentation, a fine needle aspiration cytology was performed, revealing the presence of an adenocarcinoma with a recurring follicular pattern.(36)

Follicular thyroid carcinomas exhibit a higher tendency for spreading to distant sites compared to both papillary and anaplastic thyroid carcinomas. (8)

Pain Management in Thyroid Carcinoma:

Effective pain management is crucial in optimizing the postoperative care of thyroid carcinoma patients. Surgical interventions, such as total thyroidectomy, lobectomy, and subtotal thyroidectomy, are integral components of the therapeutic strategy. While these procedures aim to remove neoplastic tissue, the associated pain requires meticulous consideration.(37)

Patients undergoing thyroid surgery may experience varying degrees of postoperative pain, necessitating a comprehensive pain management plan. A multimodal approach, incorporating pharmacological and non-pharmacological interventions, should be tailored to individual patient needs. Non-opioid analgesics, such as nonsteroidal anti-inflammatory drugs (NSAIDs), can play a pivotal role in mitigating pain while minimizing opioid-related side effects.(38)

Furthermore, assessing the impact of pain on the health-related quality of life (HRQoL) is imperative. The consideration of HRQoL in treatment decision-making underscores the holistic approach required in managing thyroid carcinoma patients.

The complexity of pain management in thyroid carcinoma patients necessitates a nuanced and specialized approach.(39)

Multimodal Pain Management:

A multimodal pain management strategy involves combining various interventions to target different pain pathways, providing more comprehensive relief with reduced reliance on opioids. Non-opioid analgesics, such as acetaminophen, can be incorporated into the regimen to address mild to moderate pain levels. The synergistic effects of combining different classes of medications, such as NSAIDs and acetaminophen, contribute to enhanced pain control.(40)

Nonsteroidal Anti-Inflammatory Drugs (NSAIDs):

NSAIDs play a pivotal role in mitigating pain associated with thyroid surgeries by inhibiting inflammatory pathways. The use of NSAIDs is particularly beneficial in reducing postoperative pain and inflammation, contributing to an overall improvement in patient comfort.

However, cautious monitoring for potential side effects, such as gastrointestinal bleeding or impaired renal function, is essential.(41)

Opioid Analgesics:

In cases of more severe pain, opioid analgesics may be considered as part of the pain management plan.Opioids should be prescribed judiciously, with careful consideration of the potential for side effects, including respiratory depression, constipation, and the risk of addiction.Short-term use and a gradual tapering-off approach are recommended to minimize the risk of dependence.(42)

Local Anesthetics:

Local anesthetic techniques, such as regional nerve blocks or wound infiltration, can be employed to provide targeted pain relief. These techniques offer the advantage of minimizing systemic side effects associated with oral medications while directly addressing pain at the surgical site. Continuous infusion of local anesthetics through catheters may be considered for sustained relief in the postoperative period.(39)

Patient-Controlled Analgesia (PCA):

PCA allows patients to self-administer predetermined doses of analgesics, typically opioids, within established safety limits. This method empowers patients to manage their pain effectively while avoiding the delays associated with traditional nurse-administered pain medications.(43)Physical Therapy and Non-Pharmacological Interventions: Incorporating physical therapy and non-pharmacological interventions, such as relaxation techniques and guided imagery, into the pain management plan can complement pharmacological approaches. These modalities contribute to a holistic approach that addresses both the physical and psychological aspects of pain.

Assessment of Health-Related Quality of Life (HRQoL):

Beyond the immediate postoperative period, continuous assessment of HRQoL is essential to gauge the impact of pain on a patient's overall well-being.Tailoring the pain management plan based on individual patient experiences and preferences ensures a patient-centered approach.(44)

Conclusion:

This narrative review delves into the multifaceted landscape of thyroid carcinoma, ranging from the highly aggressive anaplastic type to the more manageable differentiated subtypes. Understanding the nuances of each carcinoma is crucial for effective diagnosis and treatment.

For anaplastic thyroid carcinoma, the limited therapeutic options for late-stage cases highlight the need for innovative approaches to improve patient outcomes. In contrast, papillary thyroid carcinoma offers a generally positive prognosis, with evolving surgical techniques and health-related quality of life considerations guiding treatment decisions. Hurthle cell carcinoma is a rare and aggressive entity, emphasizing the importance of timely intervention and the role of surgery in achieving the best possible outcomes.

Medullary thyroid carcinoma, both hereditary and sporadic, underlines the significance of genetic testing for early diagnosis and the recommendation of thyroidectomy for mutation carriers. Additionally, the differentiated forms of thyroid carcinoma necessitate individualized treatment strategies, considering factors such as surgery extent, radioiodine therapy, and vigilant long-term follow-up.

This comprehensive review provides valuable insights for clinicians and researchers, paving the way for a better understanding of thyroid carcinoma and improved patient care. The diverse array of thyroid cancers necessitates tailored approaches that encompass both traditional and emerging treatments to enhance patient outcomes and quality of life.

an individualized and comprehensive pain management strategy is vital in the postoperative care of thyroid carcinoma patients. By employing a multimodal approach, carefully selecting medications, and considering non-pharmacological interventions, healthcare providers can enhance pain control while minimizing potential side effects. Regular assessment of HRQoL further ensures a holistic and patient-centric approach to pain management in the context of thyroid carcinoma surgeries.

Acknowledgments

The researchers express their sincere gratitude to the Ethics and Research Committee and of Mazandaran University of Medical Sciences, the affiliated colleges and medical centers, the students and staff of the university, and the medical centers affiliated with Mazandaran University of Medical Sciences.

Authorship

all authors meet the ICMJE authorship criteria

Conflicts of interest

No potential conflict of interest relevant to this article was reported.

Funding

The authors received no financial support for this article's research, authorship, and publication.

References

1. Liu T-R, Xiao Z-W, Xu H-N, Long Z, Wei F-Q, Zhuang S-M, et al. Treatment and prognosis of anaplastic thyroid carcinoma: a clinical study of 50 cases. PloS one. 2016;11(10):e0164840.
2. Schlumberger MJ, Torlantano M. Papillary and follicular thyroid carcinoma. Bailliere's best practice & research Clinical endocrinology & metabolism. 2000;14(4):601-13.

3. Zhou X, Zheng Z, Chen C, Zhao B, Cao H, Li T, et al. Clinical characteristics and prognostic factors of Hurthle cell carcinoma: a population based study. BMC cancer. 2020;20:1-9.
4. Dionigi G, Bianchi V, Rovera F, Boni L, Piantanida E, Tanda ML, et al. Medullary thyroid carcinoma: surgical treatment advances. Expert review of anticancer therapy. 2007;7(6):877-85.
5. Barney BM, Hitchcock YJ, Sharma P, Shrieve DC, Tward JD. Overall and cause-specific survival for patients undergoing lobectomy, near-total, or total thyroidectomy for differentiated thyroid cancer. Head & neck. 2011;33(5):645-9.
6. Schlumberger MJ. Papillary and follicular thyroid carcinoma. New england journal of medicine. 1998;338(5):297-306.
7. Sugino K, Kameyama K, Ito K, Nagahama M, Kitagawa W, Shibuya H, et al. Does Hürthle cell carcinoma of the thyroid have a poorer prognosis than ordinary follicular thyroid carcinoma? Annals of surgical oncology. 2013;20:2944-50.
8. Krishnamurthy A. Clavicle metastasis from carcinoma thyroid- an atypical skeletal event and a management dilemma. Indian journal of surgical oncology. 2015;6(3):267-70.
9. Schlumberger MJJNejom. Papillary and follicular thyroid carcinoma. 1998;338(5):297-306.
10. Barney BM, Hitchcock YJ, Sharma P, Shrieve DC, Tward JD. Overall and cause-specific survival for patients undergoing lobectomy, near-total, or total thyroidectomy for differentiated thyroid cancer. Head Neck. 2011;33(5):645-9.
11. Kaplan E, Angelos P, Applewhite M, Mercier F, Grogan RHJE. Surgery of the thyroid. 2015.
12. Haigh PIJCtoio. Follicular thyroid carcinoma. 2002;3(4):349-54.
13. Wu Z, Han L, Li W, Wang W, Chen L, Yao Y, et al. Which is preferred for initial treatment of papillary thyroid cancer, total thyroidectomy or lobotomy? Cancer Medicine. 2021;10(5):1614-22.
14. Kohli PS, Soni NK. Nasal tip metastasis: an unusual site and mode of spread in anaplastic thyroid carcinoma. Indian journal of otolaryngology and head and neck surgery : official publication of the Association of Otolaryngologists of India. 2008;60(3):269-70.
15. Wächter S, Vorländer C, Schabram J, Mintziras I, Fülber I, Manoharan J, et al. Anaplastic thyroid carcinoma: changing trends of treatment strategies and associated overall survival. European archives of oto-rhino-laryngology : official journal of the European Federation of Oto-Rhino-Laryngological Societies (EUFOS) : affiliated with the German Society for Oto-Rhino-Laryngology - Head and Neck Surgery. 2020;277(5):1507-14.
16. Lan Y, Cao L, Song Q, Jin Z, Xiao J, Yan L. The quality of life in papillary thyroid microcarcinoma patients undergoing lobectomy or total thyroidectomy: a cross-sectional study. Cancer Med. 2021; 10 (6): 1989-2002.
17. Liu Z, Li Y, Wang Y, Xiang C, Yu X, Zhang M, et al. Comparison of the transoral endoscopic thyroidectomy vestibular approach and open thyroidectomy: A propensity score–matched analysis of surgical outcomes and safety in the treatment of papillary thyroid carcinoma. Surgery. 2021;170(6):1680-6.
18. Chai YJ, Suh H, Woo J-W, Yu HW, Song R-Y, Kwon H, et al. Surgical safety and oncological completeness of robotic thyroidectomy for thyroid carcinoma larger than 2 cm. Surgical endoscopy. 2017;31:1235-40.
19. Hughes DT, Doherty GM. Central neck dissection for papillary thyroid cancer. Cancer control : journal of the Moffitt Cancer Center. 2011;18(2):83-8.
20. Zavitsanos P, Amdur RJ, Drew PA, Cusi K, Werning JW, Morris CG. Favorable outcome of Hurthle cell carcinoma of the thyroid treated with total thyroidectomy, radioiodine, and selective use of external-beam radiotherapy. American Journal of Clinical Oncology. 2017;40(4):433-7.
21. Phitayakorn R, McHenry CR. Follicular and Hürthle cell carcinoma of the thyroid gland. Surgical Oncology Clinics. 2006;15(3):603-23.
22. Dionigi G, Bianchi V, Rovera F, Boni L, Piantanida E, Tanda ML, et al. Medullary thyroid carcinoma: surgical treatment advances. Expert Rev Anticancer Ther. 2007;7(6):877-85.
23. Roy M, Chen H, Sippel RS. Current understanding and management of medullary thyroid cancer. The Oncologist. 2013;18(10):1093-100.
24. Lallier M, St-Vil D, Giroux M, Hout C, Gaboury L, Oligny L, et al. Prophylactic thyroidectomy for medullary thyroid carcinoma in gene carriers of MEN2 syndrome. Journal of pediatric surgery. 1998;33(6):846-8.
25. Stoffer SS, Kobernick SD, Zirkin RM, Hamburger SW, Harold SE. Medullary carcinoma of the thyroid with bone metastasis. Henry Ford Hospital medical journal. 1982;30(2):90-2.
26. Barney BM, Hitchcock YJ, Sharma P, Shrieve DC, Tward JDJH, neck. Overall and cause-specific survival for patients undergoing lobectomy, near-total, or total thyroidectomy for differentiated thyroid cancer. 2011;33(5):645-9.
27. Yu X, Wang W, Teng X, Wang H, Chen X, Wang H, et al. Clinicopathological and prognostic analysis of follicular thyroid carcinoma in a single institute over a 15-year period. 2014;40(7):869-74.
28. Podda M, Saba A, Porru F, Reccia I, Pisanu AJWjoso. Follicular thyroid carcinoma: differences in clinical

relevance between minimally invasive and widely invasive tumors. 2015;13(1):1-7.

29. Sugino K, Kameyama K, Nagahama M, Kitagawa W, Shibuya H, Ohkuwa K, et al. Follicular thyroid carcinoma with distant metastasis: outcome and prognostic factor. 2014:EJ13-0437.

30. Song HJ, Wu CG, Xue YL, Xu YH, Qiu ZL, Luo QY. Percutaneous osteoplasty combined with radioiodine therapy as a treatment for bone metastasis developing after differentiated thyroid carcinoma. Clinical nuclear medicine. 2012;37(6):e129-33.

31. Sonavane SN, Upadhye T, Basu S. Sellar-Parasellar and Petrous Bone Metastasis from Differentiated Thyroid Carcinoma: Imaging Characteristics and Follow-Up Profile Post Radioiodine Therapy. World journal of nuclear medicine. 2023;22(2):144-9.

32. Shaha AR, Jaffe BM. Completion thyroidectomy: a critical appraisal. Surgery. 1992;112(6):1148-52; discussion 52-3.

33. Staubitz JI, Musholt PB, Musholt TJ. The surgical dilemma of primary surgery for follicular thyroid neoplasms. Best practice & research Clinical endocrinology & metabolism. 2019;33(4):101292.

34. Megwalu UC, Green RWJAR. Total thyroidectomy versus lobectomy for the treatment of follicular thyroid microcarcinoma. 2016;36(6):2899-902.

35. Pacini F, Cetani F, Miccoli P, Mancusi F, Ceccarelli C, Lippi F, et al. Outcome of 309 patients with metastatic differentiated thyroid carcinoma treated with radioiodine. 1994;18(4):600-4.

36. Kalra R, Pawar R, Hasija S, Chandna A, Sankla M, Malhotra C. Frontal bone metastasis from an occult follicular thyroid carcinoma: Diagnosed by FNAC. Journal of cytology. 2017;34(1):59-61.

37. Wattier JM, Caïazzo R, Andrieu G, Kipnis E, Pattou F, Lebuffe G. Chronic post-thyroidectomy pain: Incidence, typology, and risk factors. Anaesthesia, critical care & pain medicine. 2016;35(3):197-201.

38. Haugen TW, Andera LN, LaMadrid AB. Awake thyroidectomy. The Laryngoscope. 2020;130(3):685-90.

39. Sanabria A, Betancourt C, Chiesa-Estomba C, Coca-Pelaz A, Florek E, Guntinas-Lichius O, et al. Locoregional strategies to decrease postoperative pain and neck discomfort after open thyroidectomy: A scoping review. Head & neck. 2023;45(7):1841-55.

40. Linos D, Christodoulou S, Kitsou V, Karachaliou A, Ntelis S, Petralias A. Health-Related Quality of Life and Cosmesis After Thyroidectomy: Long-Term Outcomes. World journal of surgery. 2020;44(1):134-41.

41. Lee M, Rhee J, Kim Y, Jung YH, Ahn SH, Jeong WJ. Perioperative risk factors for post-thyroidectomy hematoma: Significance of pain and ketorolac usage. Head & neck. 2019;41(10):3656-60.

42. Tharakan T, Jiang S, Fastenberg J, Ow TJ, Schiff B, Smith RV, et al. Postoperative Pain Control and Opioid Usage Patterns among Patients Undergoing Thyroidectomy and Parathyroidectomy. Otolaryngology--head and neck surgery : official journal of American Academy of Otolaryngology-Head and Neck Surgery. 2019;160(3):394-401.

43. Barros A, Vale CP, Oliveira FC, Ventura C, Assunção J, Fontes Ribeiro CA, et al. Dexamethasone effect on postoperative pain and tramadol requirement after thyroidectomy. Pharmacology. 2013;91(3-4):153-7.

44. Lee MC, Park H, Lee BC, Lee GH, Choi IJ. Comparison of quality of life between open and endoscopic thyroidectomy for papillary thyroid cancer. Head & neck. 2016;38 Suppl 1:E827-31.