

observation was made (RR 0.99; 95% CI:0.79,1.22, $p=0.89$, $I^2=82\%$). Sensitivity analysis confirmed the stability of the result. Egger's test, and Begg's test found no publication bias of analysis ($p=0.824$; $p=0.602$). This meta-analysis demonstrated that overall, no statistically significant association between RAI treatment and birth rates in female patients within their reproductive ages diagnosed with well-differentiated thyroid cancer. However, in the subgroup analysis, an association was found between RAI treatment and reduced birth rates in females <25 years old and those >35 years old. In contrast, no association of RAI treatment with birth rates in females 25-34 years old was found. More highly powered prospective studies of this topic are needed in the future to further elucidate the impact of RAI treatment on birth rates and fertility.

Thyroid

THYROID CANCER

Characteristics and Difficulties in the Management of Thyroid Microcarcinoma in Algeri

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Introduction: Thyroid cancer prevalence has increased significantly in recent years, including in Algeria, which primarily concerned microcarcinoma making 30 to 50% of new diagnosed cases. Despite its good prognosis, its management remains highly controversial and debated. We aim to describe characteristics of thyroid microcarcinoma in a series from eastern Algeria monitored in the endocrinology department of Constantine University Hospital and to report the difficulties pertaining to its management. **Patients and Methods:** A descriptive retrospective study including patients followed and monitored in the thyroid cancer register in the endocrinology department of Constantine University Hospital during the period between January 2015 and December 2018. **Results:** Of 70 cases of thyroid microcarcinomas, mean age was 44 years [17-84 years] and 94% were women. 94% of the cases were papillary microcarcinomas; the two most frequent variants were the classic papillary and the vesicular variant of papillary carcinoma in 80% of cases. The diagnosis was made following a multi-nodular goiter exploration in 60% and thyroid function was normal in 50%. Multifocality and bilaterality were reported in 27% and 5.71% of cases respectively. The most common surgical procedure was total thyroidectomy (96%), without lymph node dissection (86%). Classification of the initial risk was impossible due to the insufficient data in 28% of cases. 52% of patients received RAI therapy and 81% were in complete remission. **Conclusion:** Thyroid microcarcinoma has a good prognosis; however, its management faces several issues, mainly the stratification of risk which would be a source of overtreatment.

Thyroid

THYROID CANCER

Circulating Tumour Cells and MicroRNA in Thyroid Cancer - a Systematic Review

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Background: Thyroid cancer (TC) is the most common endocrine malignancy worldwide. Currently available circulating biomarkers such as thyroglobulin and calcitonin present severe limitations to the diagnosis and management of often difficult-to-diagnose lesions. There is increasing interest in the utility of circulating tumour cells (CTCs) and microRNAs to diagnose and optimise the management of patients with TC.

Methods: In this study, we undertake a systematic review to gain a better understanding of the utility of CTCs and microRNAs in the diagnosis and management of patients with TC. A systematic review of the literature was performed by searching electronic bibliographic databases MEDLINE, EMBASE, SCOPUS and Web of Science. Studies which measured CTCs or microRNA levels in peripheral blood from TC patients were included. Review articles, conference abstracts, and foreign language papers were excluded.

Results: There were 238 records screened for inclusion. Full texts of 47 articles were reviewed and included for qualitative analysis.

CTCs demonstrated value in disease monitoring by distinguishing between disease recurrence and remission in patients with papillary thyroid cancer (PTC) and differentiated thyroid cancer (DTC). Higher CTC counts were associated with poorer progression free survival. This is consistent with CTC studies in other cancers such as breast and colorectal.

A total of 31 microRNA biomarker candidates were investigated in studies reviewed. Circulating miR-222, miR-221 and miR-146b were most commonly increased in patients with PTC compared to benign nodules and healthy controls, and were associated with poorer prognostic factors including extrathyroidal invasion and metastatic lymph nodes. Circulating miR-222-3p and miR-17-5p demonstrated discriminatory power between medullary thyroid cancer (MTC) and benign nodules and healthy controls.

Conclusion: CTCs demonstrate a promising avenue for disease monitoring and detection of local and distant recurrence in patients with DTC. Several microRNA candidates demonstrate value in diagnosis of PTC and MTC. There is a large degree of heterogeneity in studies assessing the utility of microRNA biomarker candidates. Further studies are warranted to ascertain the value of circulating microRNA in disease monitoring and prognosis.

Thyroid

THYROID CANCER

Clinical Outcomes of Differentiated Thyroid Cancer With Gross Extrathyroidal Extension Into the Strap Muscles: A Case Control Study

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Background: The 8th edition of the American Joint Committee on Cancer/tumor-node-metastasis (AJCC/TNM) staging system for differentiated thyroid cancer (DTC), implemented in January 2018, classifies patients \geq 55 years of age with gross extrathyroidal extension (ETE) of the primary tumor into the overlying strap muscles as prognostic stage II. However, it remains controversial as to whether or not gross ETE into the strap muscles is an independent predictor of recurrence, response to therapy, need for additional therapies, or overall survival. Using a case control study design, we evaluated the prognostic significance of gross ETE among adults.

Methods: After obtaining IRB approval, we used the tumor registry at our institution to retrospectively identify 51 AJCC stage II patients with DTC aged \geq 55 years with gross ETE into only the strap muscles (51/2,225 patients). For each of the 51 cases, we identified one control who matched on all of the following important prognostic factors: age at diagnosis (\pm 5 years), sex, histology, size of tumor (\pm 1 cm), lymph node metastases, distant metastases, completeness of resection, receipt of radioactive iodine (RAI) therapy, and duration of follow-up (\pm 5 years). The controls (n=51) had no gross ETE.

Results: In the 51 patients with gross ETE into only the strap muscles, the mean age at diagnosis was 64 years, 77% were female, 37% had lymph node metastases, and none had distant metastases. The average tumor size was 2.1 cm with the majority of patients (49/51) demonstrating papillary thyroid carcinoma (1 follicular thyroid carcinoma and 1 Hurthle cell thyroid carcinoma). Only 6% of patients (3/51) had incomplete resections and 92% (47/51) received RAI therapy. The mean duration of follow-up was 8 years. There were no statistically significant differences between the cases and controls on each of the pre-specified prognostic variables described in the methods. In addition, there were no statistically significant differences between the groups in terms of rates of recurrence: cases 18% (9/51) and controls 29% (15/51) ($p=0.24$), best response to initial therapy (excellent, biochemical incomplete, structural incomplete, or indeterminate response to therapy), and need for subsequent interventions including surgery, RAI, external beam radiation, or systemic therapy. Furthermore, there were no statistically significant differences between the cases and controls with respect to 10-year disease-free survival (cases 83% and controls 68%, $p=0.90$) and 10-year overall survival (cases 97% and controls 89%, $p=0.10$).

Conclusions: In a case control analysis with a mean follow up of 8 years, the presence of ETE into the strap muscles was not an independent predictor of worse clinical outcomes in adults \geq 55 years old with DTC. These findings can be used to inform the future editions of the AJCC/TNM and American Thyroid Association staging systems for DTC.

Thyroid

THYROID CANCER

Comparison of Diagnostic Performance in Thyroid Nodules on US: Deep Convolutional Neural Network Models vs Endocrinologists With Various Experiences

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Objectives: To diagnose thyroid cancer, ultrasonography is a primary tool, but diagnostic accuracy varies according to the proficiency of clinicians. The aim of this study was to compare diagnostic performance between deep convolutional neural network (CNN) models and endocrinologist with various experiences. **Methods:** Patients who underwent fine needle aspiration at endocrinology department in Seoul National University Hospital, between April 2014 and June 2019, were reviewed. Among them, thyroid nodules which were pathologically confirmed by surgery and maximal diameter greater than 1cm were included. Ultrasonography images of thyroid nodules were reviewed by 13 endocrinologists with various experiences: 0 month (E0, n=8), 1 year (E1, n=2), and $>$ 5 years (E5, n=3). **Results:** Of total 451 thyroid nodules, 66.5% was diagnosed as cancer and 83.7% was papillary thyroid cancer (PTC). Sensitivity and specificity of CNN were 85.3% and 63.6%, respectively, and its area under the curve (AUC) was 0.855. Compared to CNN, mean accuracy of E0 group was significantly lower (Accuracy 68.7% vs 78.0%, $P < 0.001$), and after CNN-assistance, that of E0 was significantly improved (68.7% [before] vs 73.93% [after], $P = 0.008$). E1 and E5 groups showed similar diagnostic performance to CNN, and CNN-assistance did not change it. Next, subgroup analysis was performed according to the histologic subtypes. AUC of CNN in PTC (0.925) was much higher than that of other cancers including FTC (0.529). Interestingly, CNN-assistance significantly improved diagnostic performance for PTC not only in beginners (E0), but also a subset of experienced endocrinologist (E1 and E5). **Conclusions:** CNN has good diagnostic performance in the diagnosis of PTC. Endocrinologist with lower experience in ultrasonography, CNN-assistance is beneficial for improving diagnostic performance especially in PTC.

Thyroid

THYROID CANCER

Effect of Metabolic Health on Severity of Thyroid Cancer: The Scripps Clinic Thyroid Cancer Cohort Analysis

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Introduction: The increasing prevalence of obesity has been linked to increased risk of cancers such as prostate, breast and endometrium, but its role in thyroid cancer is not clearly established. Since prevalence of obesity-related metabolic disturbances (dyslipidemia, dysglycemia) varies among individuals, it has been suggested that poor metabolic