

The endocrine impact of immunotherapy: audit and future service implications

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Abstract

Aim

To assess thyroid immune-related adverse events (irAEs) in patients receiving immune checkpoint inhibitors (ICIs) and estimate future endocrine service burden.

Methods

A retrospective audit was conducted of patients who received ICIs at St James's Hospital from July to December 2022. Data included cancer type, ICI regimen, thyroid function test (TFT) abnormalities, and levothyroxine initiation. Management was evaluated against European Society of Endocrinology (ESE) guidelines. Prescribing data from Q3/4 2024 was used to project future case numbers.

Results

Among 96 patients, 10 (10.4%) developed thyroiditis and 9 (9.4%) hypothyroidism without prior thyroiditis. 46 (47.9%) had other TFT abnormalities. 9 of 11 (82%) of those started on levothyroxine were appropriately managed. Recent ICI prescribing showed a 329% increase in use, projecting approximately 280 cases of abnormal TFTs per 6-month period going forward.

Discussion/Conclusion

These findings support the need for proactive monitoring, guideline adherence, and strengthened endocrine-oncology collaboration to manage rising clinical demand.

Introduction

Immune checkpoint inhibitors (ICIs), particularly those targeting PD-1, PD-L1, or CTLA-4, have transformed cancer treatment. However, their mechanism of action may lead to immune-related adverse events (irAEs), with thyroid dysfunction among the most common

endocrine complications.^{1,2} While incidence varies by regimen, thyroiditis and hypothyroidism are consistent challenges across oncology settings.³

As immunotherapy expands to earlier-stage cancers, endocrine service burden is expected to rise.³ Many cases are asymptomatic but require clinical interpretation, ongoing follow-up, and long-term hormone replacement. Most guidelines recommend routine TFT monitoring during treatment, but pathways often remain oncologist-led with ad hoc endocrine involvement.^{4,5}

This audit evaluated the incidence and nature of thyroid dysfunction following ICIs in a tertiary centre and used recent prescribing trends to estimate future case volume—highlighting the need for anticipatory endocrine service planning.

Methods

A retrospective review included all patients who received at least one cycle of ICI (pembrolizumab, nivolumab, ipilimumab, durvalumab, atezolizumab, or cemiplimab) at St James's Hospital (SJH) between 1 July and 31 December 2022.

Data was extracted from electronic records and included malignancy type, immunotherapy regimen, adherence with ESMO guidelines for monitoring, TFT results before, during, and after treatment, dates of abnormality onset and resolution, and initiation of levothyroxine. TFT patterns were classified as thyroiditis, hypothyroidism without preceding thyroiditis, or other abnormalities requiring interpretation.

Levothyroxine use was assessed for concordance with ESE guidelines. Treatment was considered appropriate in patients with TSH >10 and low FT4, and not routinely indicated with TSH 4-10 and normal FT4.

To assess service impact, immunotherapy prescribing data from Q3/4 2024 was used to estimate expected patient volumes in the next equivalent 6-month period. Associations between variables were analysed using chi-square and Fisher's exact tests.

Results

All 96 patients (100%) underwent routine thyroid function monitoring as part of a standardised immunotherapy bloods bundle in SJH in line with ESMO guidance. Thyroiditis occurred in 10 patients (10.4%), with a median onset of 31 days (IQR 20-58) and resolution at 35 days (IQR 23-58). One patient had a prolonged course. Hypothyroidism without prior thyroiditis developed in 9 patients (9.4%), with a median onset of 105 days (range 29-208), typically presenting later than thyroiditis.

Another 46 patients (47.9%) had TFT abnormalities: 15 subclinical hypothyroidism, 5 subclinical hyperthyroidism, 15 mild biochemical derangements, 9 with pre-existing hypothyroidism, and 1 with pre-existing hyperthyroidism.

Levothyroxine was initiated in 11 patients. Nine (81.8%) were managed appropriately. Two were treated without clear biochemical indication.

There was no significant association between cancer type and thyroid irAE ($p = 0.138$). A trend toward significance was observed with ICI regimen ($p = 0.071$), suggesting possible variation in endocrine risk across agents.

In Q3/4 2024, 412 patients received ICIs—a 329% increase compared to the 96 treated in the same 6-month period in 2022. Applying the observed rates, in a 6-month period 43 would develop thyroiditis, 39 hypothyroidism, and 197 would require interpretation or follow-up for abnormal TFTs.

Discussion

Thyroid irAEs were common, with nearly one in five patients developing overt thyroiditis or hypothyroidism and nearly half experiencing TFT abnormalities requiring clinical review. These findings mirror published literature and highlight the early onset of thyroiditis versus later development of hypothyroidism, reinforcing the need for continued monitoring throughout ICI therapy.

Most patients were managed in line with current ESE guidelines, though some received unnecessary hormone replacement—illustrating variability in practice and underscoring the value of structured care pathways and education.

Projected immunotherapy growth suggests thyroid irAEs will become a major component of endocrine workload. Without proactive planning, services may face capacity issues. Anticipated increases in biochemical testing, consultation requests, and long-term follow-up will require strategic workforce planning and integration of endocrine expertise into oncology pathways.

Endocrine-oncology collaboration should move from reactive consultation to embedded multidisciplinary care. This audit provides practical insights into service-level consequences of immunotherapy prescribing and supports the case for anticipatory guideline-informed workflows and resource allocation.

Declarations of Conflicts of Interest:

None declared.

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