THYMIC EPITHELIAL TUMOURS

STRUCTURED REPORTING PROTOCOL

(1st Edition 2016)

Based on the:

International Collaboration on Cancer Reporting (ICCR)

Thymic Epithelial Tumours Dataset

www.ICCR-Cancer.org
Core Document versions:

- ICCR Thymic Epithelial Tumours Histopathology Reporting Guide 1st edition v1.0
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Scope

This protocol contains standards and guidelines for the preparation of structured reports for thymic epithelial tumours. It includes resection specimens of the thymus ie thymoma, neuroendocrine tumours of the thymus and thymic carcinoma but excludes germ cell tumours and other primary thymic neoplasms.

Structured reporting aims to improve the completeness and usability of pathology reports for clinicians, and improve decision support for cancer treatment. The protocol provides the framework for the reporting of any thymic epithelial tumours, whether as a minimum data set or fully comprehensive report.
**Abbreviations**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>AJCC</td>
<td>American Joint Committee on Cancer</td>
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<tr>
<td>IHC</td>
<td>Immunohistochemistry</td>
</tr>
<tr>
<td>IHI</td>
<td>Individual health identifier</td>
</tr>
<tr>
<td>LIS</td>
<td>Laboratory Information System</td>
</tr>
<tr>
<td>MRN</td>
<td>Medical Record Number</td>
</tr>
<tr>
<td>NHI</td>
<td>National Health Identifier (NZ)</td>
</tr>
<tr>
<td>PBS</td>
<td>Pharmaceutical Benefits Scheme</td>
</tr>
<tr>
<td>RCPA</td>
<td>Royal College of Pathologists of Australasia</td>
</tr>
<tr>
<td>TNM</td>
<td>tumour-node-metastasis</td>
</tr>
<tr>
<td>UHI</td>
<td>Unique Health Identifier</td>
</tr>
<tr>
<td>UICC</td>
<td>International Union Against Cancer</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
</tbody>
</table>
Definitions

The table below provides definitions for general or technical terms used in this protocol. Readers should take particular note of the definitions for ‘standard’, ‘guideline’ and ‘commentary’, because these form the basis of the protocol.

Ancillary study
An ancillary study is any pathology investigation that may form part of a cancer pathology report but is not part of routine histological assessment.

Clinical information
Patient information required to inform pathological assessment, usually provided with the specimen request form, also referred to as “pre-test information”.

Commentary
Commentary is text, diagrams or photographs that clarify the standards (see below) and guidelines (see below), provide examples and help with interpretation, where necessary (not every standard or guideline has commentary).

Commentary is used to:
- define the way an item should be reported, to foster reproducibility
- explain why an item is included (e.g. how does the item assist with clinical management or prognosis of the specific cancer).
- cite published evidence in support of the standard or guideline
- state any exceptions to a standard or guideline.

In this document, commentary is prefixed with ‘CS’ (for commentary on a standard) or ‘CG’ (for commentary on a guideline), numbered to be consistent with the relevant standard or guideline, and with sequential alphabetic lettering within each set of commentaries (eg CS1.01a, CG2.05b).

General commentary
General commentary is text that is not associated with a specific standard or guideline. It is used:
- to provide a brief introduction to a chapter, if necessary
- for items that are not standards or guidelines but are included in the protocol as items of potential importance, for which there is currently insufficient evidence to recommend their inclusion.
  (Note: in future reviews of protocols, such items may be reclassified as either standards or guidelines, in line with diagnostic and prognostic advances, following evidentiary review).
Guidelines are recommendations; they are not mandatory, as indicated by the use of the word ‘should’. Guidelines cover items that are unanimously agreed should be included in the dataset but are not supported by NHMRC level III-2 evidence. These elements may be clinically important and recommended as good practice but are not yet validated or regularly used in patient management.

Guidelines include key information other than that which is essential for clinical management, staging or prognosis of the cancer such as macroscopic observations and interpretation, which are fundamental to the histological diagnosis and conclusion eg macroscopic tumour details, block identification key, may be included as either required or recommended elements by consensus of the expert committee. Such findings are essential from a clinical governance perspective, because they provide a clear, evidentiary decision-making trail.

Guidelines are not used for research items.

In this document, guidelines are prefixed with ‘G’ and numbered consecutively within each chapter (eg G1.10).

**Macroscopic findings**  Measurements, or assessment of a biopsy specimen, made by the unaided eye.

**Microscopic findings**  In this document, the term ‘microscopic findings’ refers to histomorphological assessment.

**Predictive factor**  A *predictive factor* is a measurement that is associated with response or lack of response to a particular therapy.

**Prognostic factor**  A *prognostic factor* is a measurement that is associated with clinical outcome in the absence of therapy or with the application of a standard therapy. It can be thought of as a measure of the natural history of the disease.
Standard Standards are mandatory, as indicated by the use of the term ‘must’. Standards are essential for the clinical management, staging or prognosis of the cancer. These elements will either have evidentiary support at Level III-2 or above (based on prognostic factors in the NHMRC levels of evidence\textsuperscript{1} document). In rare circumstances, where level III-2 evidence is not available an element may be made a Standard where there is unanimous agreement in the expert committee. An appropriate staging system eg Pathological TNM staging would normally be included as a required element. These elements must be recorded and at the discretion of the pathologist included in the pathology report according to the needs of the recipient of the report.

The summation of all standards represents the minimum dataset for the cancer.

In this document, standards are prefixed with ‘S’ and numbered consecutively within each chapter (eg $S1.02$).

Structured report A report format which utilises standard headings, definitions and nomenclature with required information.

Synoptic report A structured report in condensed form (as a synopsis or precis).

Synthesis Synthesis is the process in which two or more pre-existing elements are combined, resulting in the formation of something new.

The Oxford dictionary defines synthesis as “the combination of components or elements to form a connected whole”.

In the context of structured pathology reporting, synthesis represents the integration and interpretation of information from two or more modalities to derive new information.
Introduction

Thymic epithelial tumours

Thymic epithelial neoplasms are rare tumours arising from thymic epithelial elements and accounting for approximately 0.2-1.5% of all adult malignancies. They consist of thymomas, that morphologically lack overt atypia of the epithelial component and have a cytoarchitecture resembling normal thymus; and thymic carcinomas that are overtly malignant and more commonly present with advanced stage disease. Thymomas are the commonest subtype of thymic epithelial neoplasms and are the most frequent anterior mediastinal tumours to occur in adults with an incidence of approximately 1-3 per million per year. They are of unknown aetiology, have an equal gender predilection and predominantly occur in middle-aged adults.

While many thymic epithelial neoplasms are asymptomatic at diagnosis and are identified as an incidental radiological finding, they may present with symptoms relating to mass effect, or in the case of thymomas, with a paraneoplastic autoimmune syndrome including myasthenia gravis, or more rarely, pure red cell aplasia or hypogammaglobulinaemia (Good syndrome). They mostly occur in the anterior mediastinum but can rarely arise in ectopic sites, predominantly in the neck or thorax. The treatment of choice is surgical resection depending on tumour stage. Patients with thymoma have been linked with increased rates of other tumours, particularly B-cell non-Hodgkin lymphoma possibly relating to altered immune function.

Thymic carcinomas are rarer than thymomas and account for approximately 20% of all thymic epithelial neoplasms. A wide variety of carcinoma subtypes can occur in the thymus but squamous cell carcinomas are the commonest, accounting for approximately 70-80% of cases.

While thymomas generally behave indolently with low rates of local recurrence and distant metastases, thymic carcinomas are more commonly invasive and are more likely to relapse and shorten life. Thymomas typically have high 5 and 10 year survival rates of approximately 80-100% with very low rates of recurrence following complete surgical resection. The exception is WHO type B3 thymomas that is less commonly completely resectable and has recurrence rates of 44% and a 10 year survival rate of 50-70%. By contrast, thymic carcinomas have an overall 5 year survival rate of approximately 50% depending on tumour stage and resectability.

Accurate and comprehensive macroscopic and microscopic pathological assessment of thymic epithelial tumours is essential for prognostication and treatment decision making to ensure these patients receive optimal care and outcomes.
Importance of histopathological reporting

The information contained within a pathology report includes prognostic information for the patient and treating clinical team. The content will assist in subsequent management, whether this may be surveillance, further surgery, radiotherapy or chemotherapy, or a combination of these modalities.

Benefits of structured reporting

The pathology report lays the foundation for a patient’s cancer journey and conveys information which:

- Provides the definitive diagnosis
- Includes critical information for Tumour-Node-Metastasis (TNM) staging
- Evaluates the adequacy of the surgical excision
- Provides morphological and biological prognostic markers which determine personalised cancer therapy

However, the rapid growth in ancillary testing such as immunohistochemistry, flow cytometry, cytogenetics, and molecular studies, have made the task of keeping abreast of advances on specific cancer investigations extremely difficult for pathologists. The use of structured reporting checklists by pathologists ensures that all key elements are included in the report specifically those which have clinical management, staging or prognostic implications. Consequently minimum or comprehensive datasets for the reporting of cancer have been developed\textsuperscript{12,13} around the world. Both the United Kingdom,\textsuperscript{14} and United States\textsuperscript{15} have produced standardised cancer reporting protocols or "datasets" for national use for many years.

The use of cancer reporting checklists improves completeness and quality of cancer reporting and thereby ensures an improved outcome for cancer patients. This has long term cost implications for public health by ensuring the most effective and timely treatment based on accurate and complete information.

The use of a structured reporting format also facilitates easy extraction of the necessary information by secondary users of the information ie cancer registries.

International Collaboration on Cancer Reporting

The International Collaboration on Cancer Reporting (ICCR), founded in 2011 by the Australasian (RCPA), US (CAP) and UK (RCPath) Colleges of Pathology and the Canadian Association of Pathology (CAP-ACP) in association with the Canadian Partnership Against Cancer (CPAC), was established to explore the possibilities of a collaborative approach to the development of common, internationally standardised and evidence-based cancer reporting protocols for surgical pathology specimens.

The ICCR, recognising that standardised cancer datasets have been shown to provide significant benefits for patients and efficiencies for organisations through
the ease and completeness of data capture\textsuperscript{16-19} undertook to use the best international approaches and the knowledge and experience of expert pathologists, and produce cancer datasets which would ensure that cancer reports across the world will be of the same high quality – ensuring completeness, consistency, clarity, conciseness and above all, clinical utility.

Representatives from the four countries participating in the initial collaboration undertook a pilot project in 2011 to develop four cancer datasets - Lung, Melanoma, Prostate (Radical Prostatectomy), and Endometrium. Following on from the success of this pilot project, the ICCR was joined by the European Society of Pathology (ESP) in 2013 and in 2014 incorporated a not-for-profit organisation focussed on the development of internationally agreed evidence-based datasets developed by world leading experts. The ICCR Datasets are made freely available from its website \url{www.ICCR-Cancer.org}

**Design of this protocol**

This structured reporting protocol has been developed using the ICCR dataset on thymic epithelial tumours as the foundation.

This protocol includes all of the ICCR cancer dataset elements as well as additional information, elements and commentary as agreed by the RCPA expert committee. It provides a complete framework for the assessment and documentation of all the pathological features of cancers of the thymic epithelial tumours.

ICCR dataset elements for thymic epithelial tumours are included verbatim. ICCR Required elements are mandatory and therefore represented as standards in this document. ICCR Recommended elements, that is, those which are not mandatory but are recommended, may be included as guidelines or upgraded to a standard based on the consensus opinion of the local expert committee.

The ICCR elements are identified in each chapter with the ICCR logo placed before the Standard or Guideline number or bullet and the ICCR element description and commentary is boarded by a grey box as shown below:

<table>
<thead>
<tr>
<th>ICCR</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G3.02</td>
<td>The intraglandular extent should be recorded as a percentage.</td>
</tr>
<tr>
<td>G2.03</td>
<td>If present, the laterality of the lymph nodes submitted may be recorded as left, right or bilateral.</td>
</tr>
<tr>
<td>CS2.03a</td>
<td>If present, record site and number. All lymph node tissue should be submitted for histological examination.</td>
</tr>
</tbody>
</table>

Additional commentary by the RCPA expert committee may be added to an ICCR element but is not included in the grey bordered area eg
Further information on the ICCR is available at www.iccr-cancer.org

Checklist

Consistency and speed of reporting is improved by the use of discrete data elements recorded from the checklist. Items suited to tick boxes are distinguished from more complex elements requiring free text or narrative. A structured or ‘atomic’ approach to responses is favoured, however the pathologist is encouraged to include free text or narrative where necessary to document any other relevant issues, to give reasons for coming to a particular opinion and to explain any points of uncertainty.

Report format

The structure provided by the following chapters, headings and subheadings describes the elements of information and their groupings, but does not necessarily represent the format of either a pathology report (Chapter 7) or checklist (Chapter 6). These, and the structured pathology request form (Appendix 1) are templates that represent information from this protocol, organised and formatted differently to suit different purposes.

Key documentation

- Guidelines for Authors of Structured Cancer Pathology Reporting Protocols, Royal College of Pathologists of Australasia, 2009

- ICCR Thymic Epithelial Tumours Histopathology Reporting Guide 1st edition v1.0


- The Pathology Request-Test-Report Cycle — Guidelines for Requesters and Pathology Provider

- International Thymic Malignancy Interest Group (ITMIG) https://www.itmig.org/

Changes since the last edition

Not applicable
Authority and development

This section provides information about the process undertaken to develop this protocol.

This 1st edition of the protocol is an amalgam of two separate processes:

1. This protocol is based on the ICCR dataset Thymic Epithelial Tumours Histopathology Reporting Guide 1st edition v1.0. All ICCR elements from this dataset, both required (mandatory) and recommended (optional), are included in this protocol, verbatim. (It should be noted that RCPA feedback from all Anatomical Pathology fellows and specifically the local expert committee was sought during the development process of the ICCR dataset.) Details of the ICCR development process and the international expert authoring committee responsible for the ICCR dataset are available on the ICCR website: iccr-cancer.org.

2. Additional elements, values and commentary have been included as deemed necessary by the local expert committee. In addition, the standard inclusions of our local protocols eg example reports, request information etc, have also been added.

Local expert committee

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Siaw Ming Chai, pathologist
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Annabelle Mahar, pathologist
David Moffat, pathologist
Prue Russell, pathologist
Jenny Ma Wyatt (committee chair), pathologist
Tristan Yan, surgeon

Acknowledgements

The Thymic Epithelial Tumours Expert Committee wishes to thank Dr Simon King and Margaret Dimech of the RCPA online Cut-up Manual for their contribution, as well as all the pathologists and clinicians who contributed to the discussion around this document.

Stakeholders

ACT Health
Anatomical Pathology Advisory Committee (APAC)
Australian Association of Pathology Practices Inc (AAPP)
Australian Cancer Network
Australian Commission on Safety and Quality in Health Care
Australian Society of Clinical Oncologists (ASCO)
Australian Society of Colposcopy and Cervical pathology (ASCCP)
Australian Society of Cytology (ASC)
Australian Society of Gynaecologic Oncologists (ASGO)
Cancer Australia
Cancer Council ACT
Cancer Council NSW
Cancer Council Queensland
Cancer Council SA
Cancer Council Tasmania
Cancer Council Victoria
Cancer Council Victoria Clinical Network
Cancer Council Western Australia
Cancer Institute NSW
Cancer Services Advisory Committee (CanSAC)
Cancer Voices
Clinical Oncology Society of Australia (COSA)
Department of Health and Ageing
Grampians Integrated Cancer Services (GICS)
Health Informatics Society of Australia (HISA)
Independent Review Group of Pathologists
International Collaboration on Cancer Reporting (ICCR)
Medical Software Industry Association (MSIA)
National Coalition of Public Pathology (NCOPP)
National E-Health Transition Authority (NEHTA)
National Pathology Accreditation Advisory Council (NPAAC)
National Round Table Working Party for Structured Pathology Reporting of Cancer.
New Zealand Guidelines Group (NZGG)
NSW Department of Health
Peter MacCallum Cancer Institute
Queensland Cooperative Oncology Group (QCOG)
Representatives from laboratories specialising in anatomical pathology across Australia
Royal Australasian College of Physicians (RACP)
Southern Cancer Network, Christchurch, New Zealand
Southern Melbourne Integrated Cancer Service (SMICS)
Standards Australia
The Medical Oncology Group of Australia
The Royal Australasian College of Surgeons (RACS)
The Royal Australian and New Zealand College of Obstetricians & Gynaecologists (RANZCOG)
The Royal Australian and New Zealand College of Radiologists (RANZCR)
The Royal Australian College of General Practitioners (RACGP)
The Royal College of Pathologists of Australasia (RCPA)
Western Australia Clinical Oncology Group (WACOG)

Secretariat

Meagan Judge, Royal College of Pathologists of Australasia.

Development process

This protocol has been developed following the ten-step process set out in Guidelines for Authors of Structured Cancer Pathology Reporting Protocols.22

Where no reference is provided, the authority is the consensus of the local expert group for local inclusions and the ICCR Dataset Authoring Committee for ICCR components denoted with the ICCR logo.
1 Pre-analytical

This chapter relates to information that should be recorded on receipt of the specimen in the laboratory.

The pathologist is reliant on the quality of information received from the clinicians or requestor. Some of this information may be received in generic pathology request forms, however, the additional information required by the pathologist specifically for the reporting of Thymic Epithelial Tumours is outlined in Appendix 1. Appendix 1 also includes a standardised request information sheet that may be useful in obtaining all relevant information from the requestor.

Surgical handling procedures affect the quality of the specimen and recommendations for appropriate surgical handling are included in Appendix 1.

S1.01 All demographic information provided on the request form and with the specimen must be recorded.

CS1.01a The Royal College of Pathologists of Australasia (RCPA) The Pathology Request-Test-Report Cycle — Guidelines for Requesters and Pathology Providers must be adhered to.23 This document specifies the minimum information to be provided by the requesting clinician for any pathology test.

CS1.01b The patient’s ethnicity must be recorded, if known. In particular whether the patient is of aboriginal or Torres Strait islander origin. This is in support of a government initiative to monitor the health of indigenous Australians particularly in relation to cancer.

CS1.01c The patient’s health identifiers may include the patient’s Medical Record Number as well as a national health number such as a patient’s Medicare number (Australia), Individual Healthcare Identifier (IHI) (Australia) or the National Healthcare Identifier (New Zealand).

S1.02 All clinical information as documented on the request form must be recorded verbatim.

CS1.02a The request information may be recorded as a single text (narrative) field or it may be recorded atomically.

S1.03 The pathology accession number of the specimen must be recorded.

S1.04 The principal clinician involved in the patient’s care and responsible for investigating the patient must be recorded.

CS1.04a Knowledge of the clinical presentation is an essential part of the WHO classification yet it may not be available for a number of reasons:

- The clinical assessment and staging may be incomplete at the time of biopsy.
• The pathology request is often authored by the clinician performing the biopsy rather than the clinician who is investigating and managing the patient.

• The identity of this clinician is often not indicated on the pathology request form

In practice therefore, it is important in such cases that the reporting pathologist should be able to communicate with the managing clinician for clarification.

CS1.04b The Australian Healthcare identifiers i.e. Healthcare Provider Identifier - Individual (HPI-I) and Healthcare Provider Identifier - Organisation (HPI-O) should be included, where possible, to identify the principal clinician involved in the patient's care.

G1.01 Any clinical information received in other communications from the requestor or other clinician should be recorded together with the source of that information.
2 Specimen handling and macroscopic findings

This chapter relates to the procedures required after the information has been handed over from the requesting clinician and the specimen has been received in the laboratory.

Tissue Banking

- Pathologists may be asked to provide tissue samples from fresh specimens for tissue banking or research purposes. The decision to provide tissue should only be made if the pathologist is sure that the diagnostic process will not be compromised. As a safeguard, research use of the specimen may be put on hold until the diagnostic process is complete.

Specimen handling

- Detailed fixation and specimen handling instructions are available from the RCPA online Cut-up Manual:
  
  www.rcpa.edu.au/Library/Practising-Pathology/Macroscopic-Cut-Up

Macroscopic findings

S2.01 All measurements are in SI units, unless explicitly stated.

S2.02 The labelling of the specimen(s) must be clearly recorded.

<table>
<thead>
<tr>
<th>CR</th>
<th>S2.01</th>
<th>The operative procedure should be recorded.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>CG2.01a</td>
<td>Documentation of the operative procedure is useful, as correlation of the type of procedure with the material received can be important for both pathological diagnosis and patient safety. Further, the type of surgical procedure is important in determining the assessment of surgical margins. The surgeon should inform the pathologist of the type of operation.</td>
</tr>
<tr>
<td>CR</td>
<td>S2.02</td>
<td>Specimen weight should be recorded.</td>
</tr>
<tr>
<td>CR</td>
<td>S2.03</td>
<td>The specimen(s) submitted must be recorded.</td>
</tr>
<tr>
<td>CR</td>
<td>CS2.03a</td>
<td>Specimen type should indicate what was submitted. Specimen type varies according to the type of operation.</td>
</tr>
</tbody>
</table>
If the specimen was obtained by a radical thymectomy, the specimen type is indicated as "Thymus plus surrounding tissue."

Specimens obtained by combined resection with other organs or parts thereof should be itemised, such as lung, pleura, pericardium, great vessels and myocardium. Other organs or tissues are reported as "Other" and details should be recorded.24-26 Separate extrathymic tumour nodules submitted should be recorded; these include pleural and pericardial seedings, pulmonary intraparenchymal nodules and distant organ metastasis. The location, number and size of extrathymic nodules are described later in the dataset (see SEPARATE EXTRATHYMIC TUMOUR NODULES/METASTASES).

Submitted lymph nodes should also be recorded.27,28 These may be submitted separately or within a combined mediastinal specimen, so labelling or discussion with the surgeon may be required. Further details on lymph nodes are captured later in the dataset (see LYMPH NODE STATUS).

Orientation of the specimen is crucial given the prognostic importance of margin status and pathologic tumour stage in resected thymic epithelial tumours (TET). Once the tumour is removed from the tumour bed, orientation becomes difficult. Furthermore, the fatty tissue can become easily disrupted. Therefore, orientation of the specimen ideally should be started in situ by the surgeon and areas of concern need to be clearly communicated to the pathologist. Orientating the specimen on a mediastinal board is encouraged (Figure 1).24 Anterior, posterior, right and left surfaces should be clearly distinguished (e.g. inked with different colours or with detailed block key). Furthermore, the surgeon should mark areas of concern and also representative areas adjacent to the pericardium, the innominate (brachiocephalic) vein and superior vena cava (or mark these structures if resected) and right/left mediastinal pleural surfaces (if resected).
**Mediastinal board that could be used to orient the specimen**


G2.03 The number of lymph nodes per cassette should be recorded if known.

G2.04 The thymus should be measured in 3 dimensions.

G2.05 Dimensions of each other submitted specimen should be recorded.

| **S2.04** | **The integrity of the specimen must be recorded.**
|-----------|--------------------------------------------------------|
| **CS2.04a** | Although there are no studies specifically evaluating the prognosis of patients that underwent thymectomy where the capsule was disrupted intraoperatively or the lesion was resected in fragments, it is important to record these features because in these circumstances the pathologist cannot properly evaluate the presence of capsular invasion or completeness of resection. The latter are important prognostic features.

- ‘Intact specimen’ means that a TET is either completely surrounded by a fibrous capsule or is present in its entirety within the submitted specimen, without rupture of the tumour into surrounding tissues or on to the external surface of the specimen.

- ‘Surface disrupted’ means that a TET remains in one piece but shows rupture of the tumour on to the external surface of the specimen.

- A fragmented specimen is when a TET is submitted in piecemeal form that precludes satisfactory identification of margins.

| **S2.05** | **The macroscopic site of primary tumour must be recorded.** |
CS2.05a TETs usually arise as a single nodule or mass in the thymus in the anterior mediastinum. However, cases of multiple synchronous TETs have been described.\textsuperscript{29-31} Although synchronous TETs generally occur in the thymus in the anterior mediastinum, these tumours can also occur at ectopic sites. Although rare, ectopic TETs have been described in the neck, posterior mediastinum, pretracheal fat, deep to phrenic nerves, posterior to innominate (brachiocephalic) vein, aortopulmonary window, aortocaval groove, anterior mediastinal fat, cardiphrenic fat and base of skull. Importantly, ectopic TETs should be distinguished from pleural or pericardial implants and metastases because the latter will up-stage the tumour. Many reported synchronous TETs differ in tumour subtype and stage. In addition, a case of synchronous thymoma and thymic carcinoid tumour has been reported in a patient with multiple neuroendocrine neoplasia type I.\textsuperscript{32} Therefore, when synchronous TETs are identified, each tumour should be recorded, microscopically reviewed and staged.

S2.06 The maximum dimension of primary tumour must be recorded.

CS2.06a A retrospective analysis of 5845 cases showed that size was not useful in predicting survival in relation to staging of TET, so this is viewed as a recommended rather than as a required parameter.\textsuperscript{26}

Identification of the primary tumour may be uncertain in cases with multiple foci and therefore the maximum dimension of the largest tumour should be recorded.

The maximum tumour size should still be recorded as the number of blocks sampled in a resected tumour is recommended to be 1 per centimetre of the maximum diameter. Inadequate sampling may lead to incorrect tumour classification.\textsuperscript{33}

G2.06 In the event there is more than 1 tumour, the site, the maximum dimension and distance to primary tumour should be recorded.

S2.07 The macroscopic extent of tumour spread must be recorded, where possible.

CS2.07a Extent will be recorded as:

- Macroscopic extension into mediastinal fat
- Pulmonary parenchyma, specify lobe
- Pleura, specify location
• Pericardium
• Diaphragm
• Other, describe

G2.07 The macroscopic distance of tumour to closest margin should be recorded.

CG2.07a The distance of tumour to the nearest margin should be recorded in mm and the specific margin recorded.

G2.08 The appearance of non-lesional tissue should be recorded eg biopsy related changes, cystic changes or hyperplasia etc

<table>
<thead>
<tr>
<th>S2.08</th>
<th>A block identification key listing the nature and origin of all tissue blocks must be recorded.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CG2.11a</td>
<td>In general it is considered good practice to record the origin of tissue blocks from any surgical specimen. Specifically, the block identification key, together with the description of the macroscopic specimen and possibly photographic images of the gross specimen and/or the specimen in-situ, help the pathologist to determine margin status and extent of invasion of the tumour into adjacent structures such as great vessels, pleura, pericardium and lung. The macroscopic findings should be documented in the pathology report. Completeness of tumour resection and extent of tumour spread determine the pathological tumour stage and thereby prognosis, and also influence decisions about potential adjuvant therapy. Therefore, a block identification key should be provided with a full description of the origin of each block. If the block is taken from a resection margin, the specific margin should be clearly indicated. The key should reflect whether the specimen was taken from the tumour near a specific structure or area (i.e., close to superior vena cava) and whether the tissue comes from the tumour itself, the surrounding thymic parenchyma or other sites such as mediastinal pleura, pericardium etc. Lymph nodes should be defined in the key based on location as this is potentially important for staging purposes. If the block identification key is not recorded in the final report for logistical reasons, then it must be recorded somewhere within the specimen records to ensure the information is available if/when needed.</td>
</tr>
</tbody>
</table>

G2.09 A descriptive or narrative field should be provided to record any macroscopic information that is not recorded in the above standards and guidelines, and that would normally form part of the
macroscopic description.

CG2.09a The traditional macroscopic narrative recorded at the time of specimen dissection is often reported separately from the cancer dataset. Although this remains an option, it is recommended that macroscopic information be recorded within the overall structure of this protocol.

CG2.09b Much of the information recorded in a traditional macroscopic narrative is covered in the standards and guidelines above and in many cases, no further description is required.

CG2.09c A traditional macroscopic description may be required when the Laboratory Information System (LIS) does not allow a structured approach.

CG2.09d Where the LIS offers an electronic interface for structured data entry the need for narrative can be significantly reduced to describe only information not otherwise captured.
### 3 Microscopic findings

Microscopic findings relates to purely histological (morphological) assessment. Information derived from multiple investigational modalities, or from two or more chapters of this protocol, are described in Chapter 5.

<table>
<thead>
<tr>
<th>S3.01</th>
<th>The histological tumour type must be recorded.</th>
</tr>
</thead>
</table>
| CS3.01a | Tumours should be classified according to the WHO 2015 classification system for thymic tumours.\(^2,34\)  
In cases of TETs showing more than one morphological subtype the following should be applied: |
|       | 1) TETs showing more than one histological thymoma subtype: The diagnosis in such tumours should list all the histological WHO types, starting with the predominant component and then minor components. All should be quantified in 10% increments. **This rule does not apply to AB thymoma which is a distinct entity** (this should be documented as type AB 100\%).\(^13,14\) |
|       | 2) TETs consisting of a thymic carcinoma component together with one or more thymoma component: Irrespective of the size/percentage of the thymic carcinoma component the diagnosis in such tumours should begin with the label “thymic carcinoma” (specifying the histological type and percentage) followed by the thymoma component(s) (quantified in 10% increments).\(^2,34\) |
|       | 3) TETs consisting of more than one thymic carcinoma component (with or without a thymoma component, and excluding thymic small cell carcinoma and thymic large cell neuroendocrine carcinoma, see below): The diagnosis in such tumours should begin with the predominant carcinoma; minor carcinoma components should be quantified next in 10% increments, eventually followed by the thymoma components.\(^2,34\) |
|       | 4) Heterogeneous thymic tumours with a small cell or large cell neuroendocrine carcinoma component: These tumours are labelled ‘combined small cell carcinoma’ or ‘combined large cell neuroendocrine carcinomas’; the various components should be given and |
quantified in 10% increments.

<table>
<thead>
<tr>
<th>CS3.01b</th>
<th>The WHO 2015 classification system for thymic tumours is included in Appendix 4.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S3.02</strong> The extent of direct invasion by tumour must be recorded.</td>
<td></td>
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</tbody>
</table>
| CS3.02a | The Masaoka-Koga staging system has been the most frequently used for staging,\(^{35,36}\) with refinement of definitions for anatomic staging parameters proposed in 2011,\(^{37}\) but this staging system will likely be superseded in the near future by proposals for a TNM-based classification by an International Association for the Study of Lung Cancer (IASLC), thymic domain, committee, based on data from the ITMIG retrospective database of over 8000 patients.\(^{26,28}\) Both these systems are dependent on extent of direct local invasion. Use of an elastic stain is strongly recommended in assessing involvement of mediastinal structures in relation to elastin layers within mediastinal and visceral pleura, fibrous layer of the pericardium and the adventitia and media of the great vessels.

In relation to the proposed TNM based staging system, regarding capsular invasion, its presence was not prognostically significant in the ITMIG retrospective database study and tumours would therefore be staged as pT1, independent of whether the capsule is breached. Similar data were found in a separate meta-analysis.\(^{26,38}\) However, it remains part of Masaoka-Koga staging so pathologists need to record this parameter until the TNM staging system proposed by ITMIG & IASLC\(^a\) is approved, along with the extent of any capsular invasion in the context of Masaoka-Koga stages IIA and IIB. Invasion through the mediastinal pleura was also not found to be of prognostic significance although evidence from Japanese patients demonstrated that invasion of the mediastinal pleura was associated with the cumulative incidence of recurrence (CIR)\(^{39}\) so this parameter remains part of the dataset, to be collected (a) for further review, although it is recognised that this anatomic margin may not be easily identifiable on histology,\(^{26}\) and (b) in the context of the Masaoka-Koga staging system. Discussion with the surgeon may

\(^{a}\) International Thymic Malignancy Interest Group (ITMIG) and International Association for the Study of Lung Cancer (IASLC)
facilitate its identification in specimens. In order to maintain consistency in data collection, the following definitions agreed by expert consensus, were proposed by an ITMIG-based group:

- Pericardial invasion - microscopic involvement of the pericardium (either partial in the fibrous layer or penetrating through to the serosal layer);
- Visceral pleura/lung - microscopically confirmed direct penetration through the outer elastin layer of the visceral pleura with or without invasion into the lung parenchyma.

In relation to the great vessels, opinions differed between involvement being defined as tumour cells being present within the adventitia, media or lumen. The consensus opinion, in the context of great vessels, was that tumour cells present within the media is the preferred histological compartment through which to define involvement, as it is easily seen compared to the adventitia on an elastic stain, and its involvement is likely relevant to surgical management in terms of need for partial resection and repair. In a similar fashion, involvement of the phrenic nerve is defined as tumour cells being present within the perineurium. ‘Other’ should be used if tumours infiltrate structures such as myocardium, trachea, oesophagus or chest wall. Involvement of muscle layers is viewed as the most reproducible parameter through which to collect data on positive involvement.

## CS3.02b

Invasion of vessels represents a clinical scenario with more locally aggressive/invasive disease. Invasion of the innominate vein and superior vena cava would be more likely to occur earlier than invasion of other vessels.

### S3.03

**The presence of separate extrathymic tumour nodules/metastases must be recorded.**

CS3.03a Separate extrathymic tumour nodules must be recorded as they form part of both the Masaoka-Koga and the ITMIG & IASLC-proposed TNM staging systems. These are divided into two groups. First, those nodules that are limited to the pericardium and/or pleura (sometimes referred to as pericardial and pleural seeding), which constitute stage IVa disease in Masaoka-Staging and pM1a in ITMIG & IASLC TNM staging. Second, nodules that are either within the lung parenchyma or distant organs, which constitute stage IVb disease in Masaoka-Staging and pM1b in ITMIG & IASLC TNM staging. The number of nodules in the pleura/pericardium should
be recorded as there is some evidence that greater numbers portend an adverse prognosis. These synchronous metastatic foci will usually have the same morphology as the primary thymic neoplasm and need to be distinguished from the far rarer synchronous primary thymic epithelial tumours (see MACROSCOPIC SITE OF PRIMARY TUMOUR).  

| G3.01 | The response to any neoadjuvant therapy should be recorded. |
| CG3.01a | There is no recommended or agreed system for tumour regression grading (TRG) in TETs but there are no systematic studies on this subject. In other organ systems including carcinomas of the breast, stomach, oesophagus and colorectum, there is evidence that the response to neoadjuvant therapy provides prognostic information. Schemes for TRG for several of these organ systems have been published. Steroid therapy may also affect morphology by eliminating lymphocytes although this is not viewed as part of neoadjuvant therapy. |

In TETs, RECIST (Response Evaluation Criteria In Solid Tumours) parameters have been recorded as indicators of TRG. Histological features which have been assessed as TRG factors include decrease in number of viable cells, fibrosis, necrosis and cystic change. Biological cell cycle markers (e.g. p53) were used in one study combined with viability according lung cancer parameters (25% increments). However, few studies have systematically recorded TRG elements in a methodical fashion and there are no studies which have correlated TRG with disease outcome. A scoring system for the degree of fibrosis, adapted from lung cancer TRG has been applied to TETs and it has been suggested that macroscopic evaluation with microscopic confirmation of the extent of necrosis should be recorded and that the viable tumour cell proportion should be recorded in 10% increments. It should be noted that similar changes to those documented in neoadjuvant-treated TETs may be observed in non-treated thymomas (necrosis, cystic change) as degenerative features.

It is recommended that the response to neoadjuvant treatment in TET be recorded with the following provisos:

1. TRG is performed on resection specimens
2. Resected specimens should be adequately sampled (at least 1 block per cm of maximum
3. The amount of viable tissue should be assessed as a percentage of the tumour
4. TRG should be scored by a 3-tier system

**Table 1: Proposed 3-tiered TRG system**

<table>
<thead>
<tr>
<th>Score</th>
<th>Criterion</th>
<th>TRG</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mainly viable tumour with no or minimal regression-associated fibro-inflammatory and cystic change* limited to a few foci</td>
<td>No or minimal tumour response</td>
</tr>
<tr>
<td>2</td>
<td>Multifocal or diffuse regression associated fibro-inflammatory changes and cystic change*, with viable tumour ranging from diffuse sheets, streaks or nodules, to extensive regression with multifocal but easily identifiable residual tumour.</td>
<td>Partial tumour response</td>
</tr>
<tr>
<td>3</td>
<td>Mainly regression, with few irregularly scattered individual tumour cells or cell groups (all measuring less than 2 mm), or no residual tumour identified.</td>
<td>Complete or near-complete response</td>
</tr>
</tbody>
</table>

* Regression associated fibro-inflammatory changes: fibrosis associated with macrophages, including foam cells, mixed inflammatory cells and calcification.

G3.02 The presence of any coexistent pathology should be recorded.

CG3.02a Thymectomy specimens from myasthenia gravis patients commonly demonstrate pathologic findings in the non-neoplastic thymus and the most common one is thymic follicular hyperplasia. Thymic hyperplasia can be classified into three types: follicular, epithelial and true hyperplasia. Follicular hyperplasia is defined by the presence of B-cell follicles irrespective of the size or weight of the thymus. The standardized macroscopic and histopathological work-up of thymectomy specimens including the grading of thymic follicular hyperplasia has been reported by MGTXb,49,50

Epithelial

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b Thymectomy and Myasthenia gravis multicentre, international clinical trial (MGTX)
hyperplasia (nodular epithelial hyperplasia, also called 'microscopic thymoma') is a thymic epithelial cell proliferation forming discrete microscopic islands and it is not infrequently observed in thymic tissue from myasthenia gravis patients.\textsuperscript{51,52} It should be differentiated from 'microthymoma' which represents microscopic-sized true thymoma.\textsuperscript{53} True thymic hyperplasia is an increase in volume of the thymus which maintains normal histology.\textsuperscript{54} Because of wide variations of sizes and weights of the thymus in the normal population, true thymic hyperplasia is difficult to define except for extreme cases. The presence of thymic hyperplasia adjacent to a thymoma, irrespective of the type, has no known clinical significance.

Cystic changes can involve both thymic epithelial tumours and adjacent thymus.\textsuperscript{55-59} The description of cystic changes, although not of prognostic significance, may be important for clinicopathological correlation.

<table>
<thead>
<tr>
<th>S3.04</th>
<th>Margin status must be recorded.</th>
</tr>
</thead>
</table>
| CS3.04a | Complete resection has been repeatedly shown to be a prognostic parameter in thymomas and thymic carcinomas.\textsuperscript{60-62} Therefore, the evaluation and recording of the margin status is important. To be able to assess the margins, orientation of the specimen is crucial. As discussed earlier (see MACROSCOPIC SITE OF PRIMARY TUMOUR), once the tumour is removed from the tumour bed, orientation becomes difficult. Furthermore, the fatty tissue can become easily disrupted. Therefore, orientation of the specimen ideally should be started in situ by the surgeon and areas of concern need to be clearly communicated to the pathologist. Anterior, posterior, right and left surfaces should be clearly distinguished (e.g. inked with different colours or with detailed block key). Furthermore, the surgeon should mark areas of concern and also representative areas adjacent to the pericardium, the large vessels (or mark these structures if resected) and right/left mediastinal pleural surfaces (if resected). If the resection specimen includes neighbouring organs such as lung, or large vessels, margins need to be evaluated on those organs as well.

R0 resection is defined as complete resection without macroscopic or microscopic involvement of the margin by the tumour. R1 (incomplete) resection indicates microscopic tumour at the resection margin. R2 (incomplete) resection is defined as macroscopic tumour present at the resection margin. If the specimen is
disrupted at the time of gross evaluation and cannot be reconstructed, then the assessment of margins might not be possible.

**S3.05 Lymph node status must be recorded.**

**CS3.05a** Involvement of lymph nodes by TETs is an adverse prognostic factor. Lymph node status should be recorded according to the recommended anatomic map in relation to the ITMIG & IASLC\(^c\) TNM system, namely anterior (perithymic) nodes (zone 1) and deep intrathoracic or cervical nodes (zone 2), whilst any positive lymph node is viewed as stage IVb with the Masaoka-Koga system. As the location of lymph nodes found during the gross inspection of a thymectomy specimen may be problematic, either the specimen needs to be properly oriented by the surgeon, or labelled specifically within separate pots. Lymph nodes outside N1 and N2 are regarded as distant metastasis.

**G3.03** For any involved lymph nodes, the site of involvement should be recorded.

**G3.04** A descriptive or narrative field should be provided to record any microscopic information that is not recorded in the above standards and guidelines.

\(^c\) International Thymic Malignancy Interest Group (ITMIG) and International Association for the Study of Lung Cancer (IASLC)
4 Ancillary studies findings

Ancillary studies may be used to determine lineage, clonality or disease classification or subclassification; as prognostic biomarkers; or to indicate the likelihood of patient response to specific biologic therapies.

Some studies, such as Her-2 testing, are required under the Pharmaceutical Benefits Scheme, to enable certain specific therapies to be prescribed.

<table>
<thead>
<tr>
<th>G4.01</th>
<th>The results of any immunohistochemical studies should be recorded.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CG4.01a</td>
<td>Immunohistochemical analysis of thymic resection specimens may be performed for several reasons:</td>
</tr>
<tr>
<td></td>
<td>1. To exclude or confirm the presence of a tumour of thymic epithelial origin (^{64})</td>
</tr>
<tr>
<td></td>
<td>2. To aid in sub-typing of thymomas (^{65})</td>
</tr>
<tr>
<td></td>
<td>3. To establish the origin of a thymic carcinoma as either a primary thymic carcinoma or a metastasis</td>
</tr>
</tbody>
</table>

The differential diagnostic spectrum of thymoma is related to either its epithelial component or to the lymphoid component. The lymphoid component of “B-type” thymoma and of thymic follicular hyperplasia may raise the suspicion of non-Hodgkin lymphoma. Immunohistochemistry may be applied to type the lymphoid population [normally composed of immature, CD3/terminal deoxynucleotidyl transferase (TdT/CD1a/CD99+) lymphocytes], or to confirm the presence of an epithelial component, which may be highlighted by pan-cytokeratin and/or p63 stains.

The epithelial component in thymic epithelial tumours with a sparse lymphoid component may raise the possibility of either a germ cell tumour or metastatic carcinoma \(^{64,66}\). Germ cell tumours may be diagnosed by appropriate immunohistochemical stains including OCT4, CD117, CD30, D2-40, human chorionic gonadotropin (hCG), placental alkaline phosphatase (PLAP), carcinoembryonic antigen (CEA) and α-fetoprotein (AFP) \(^{64}\).

Sub-typing of thymomas is primarily based on histology; immunohistochemical stains (cytokeratin and/or p63) may be helpful in the evaluation of the density of the epithelial cells in B-type thymoma thus aiding the diagnosis of B1/2/3 thymoma. Similarly, cytokeratin stains may be used to confirm the epithelial nature of the spindle cells in type A, type AB and in metaplastic thymoma. Epithelial expression of CD20 was reported to
be more frequent among type A and AB thymomas.67 Neuroendocrine markers may be useful to rule out neuroendocrine tumours.65

Distinguishing thymoma (in particular type B3 thymoma) and thymic carcinoma may occasionally be problematic; there are no immunohistochemical markers that can reliably segregate these entities. However, CD5, CD117 and the recently described markers GLUT1 and MUC1 show a higher incidence of staining in thymic carcinoma (in particular in thymic squamous cell carcinoma) compared to thymoma.68,69 Ki-67 labelling index in epithelial tumour cells of ≥13.5% has been suggestive of thymic carcinoma.70

The diagnosis of thymic carcinoma essentially involves the exclusion of metastasis; immunohistochemical analysis may support a diagnosis of thymic carcinoma but cannot establish the diagnosis with certainty. Expression of CD5, particularly in combination with CD117 positivity, lends some support to thymic carcinoma. Several new markers (FoxN1 and CD205) may further support a diagnosis of thymic carcinoma. Other markers may be applied to rule out thymic carcinoma by confirming a non-thymic origin, such as TTF-1. However, given the great diversity in histological subtypes of thymic carcinoma, the specificity of markers routinely used to diagnose carcinoma of a particular origin may be considerably lower in this situation.34

<table>
<thead>
<tr>
<th>G4.02</th>
<th>The results of any molecular studies should be recorded.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CG4.02a</td>
<td>Molecular studies have not been applied routinely for the diagnosis of thymic epithelial tumours. A diagnosis of NUT carcinoma needs immunohistochemical confirmation71,72 or molecular studies if immunohistochemistry is not available, and exploration of tumour-specific molecular markers is expected in the future. There have been a few reports of primary mediastinal synovial sarcoma confirmed by FISH.</td>
</tr>
</tbody>
</table>

| G4.03 | The results of any other ancillary tests should be recorded and incorporated into the pathology report. |
5 Synthesis and overview

Information that is synthesised from multiple modalities and therefore cannot reside solely in any one of the preceding chapters is described here. For example, tumour stage is synthesised from multiple classes of information – clinical, macroscopic and microscopic.

By definition, synthetic elements are inferential rather than observational, often representing high-level information that is likely to form part of the report ‘Summary’ or ‘Diagnosis’ section in the final formatted report.

Overarching case comment is synthesis in narrative format. Although it may not necessarily be required in any given report, the provision of the facility for overarching commentary in a cancer report is essential.

### S5.01 Pathology stage for thymomas and thymic carcinomas using the modified Masaoka system (with updated ITMIG definitions) must be recorded.

**CS5.01a** At least 15 different stage classification systems have been proposed, beginning as far back as 1978, with most widely known being the Masaoka system, modified refined in 1994, with refinement of definitions for anatomic staging parameters proposed in 2011 (see Appendix 5).

Although this remains the required staging system, it is highly likely that this system will be superseded by a TNM-based classification based on data from the ITMIG retrospective database of over 8000 patients. In the newly-proposed system, T stage is based on the extent of direct invasion of mediastinal structures (see above section), nodal disease is based on involvement of lymph nodes in anterior (perithymic) (N1) and deep/cervical (N2) compartments, and M stage based on the presence of separate pleural and pericardial nodules (M1a) and pulmonary intraparenchymal nodule or distant organ metastasis (M1b). This system is currently viewed as recommended, although will likely become the recognized system in the near future.

### G5.01 Pathology stage for thymic carcinomas using the proposed TNM staging system should be recorded.

**CS5.01a** As at the time of publication, the new TNM is not yet published and the Masaoka-Koga remains the most commonly used staging system for thymomas and thymic carcinomas, therefore the Masaoka has been included as a standard and the TNM a guideline. In future, this will most likely change.
S5.02 The year of publication and edition of the cancer staging systems used in S5.01 and G5.01 must be included in the report.

G5.02 The “Diagnostic summary” section of the final formatted report should include:

a. Specimen submitted (S2.03)
b. Tumour site (S2.05)
c. Tumour type (S3.01)
d. Tumour stage (S5.01 and G5.01)
e. Completeness of excision (S3.04)

S5.03 The reporting system must provide a field for free text or narrative in which the reporting pathologist can give overarching case comment.

CS5.03a This field may be used, for example, to:

- list any relevant ancillary tests
- document any noteworthy adverse gross and/or histological features
- express any diagnostic subtlety or nuance that is beyond synoptic capture
- document further consultation or results still pending.

CS5.03a Use of this field is at the discretion of the reporting pathologist.

G5.03 The edition/version number of the RCPA protocol on which the report is based should be included on the final report.

CG5.03a For example, the pathology report may include the following wording at the end of the report: “the data fields within this formatted report adhere to criteria as set out in the RCPA document “XXXXXX” Edition dated XXXXXXXXXX”.

26
6 Structured checklist

The following checklist includes the standards and guidelines for this protocol which must be considered when reporting, in the simplest possible form. The summation of all “Standards” is equivalent to the “Minimum Data Set” for thymic epithelial tumours. For emphasis, standards (mandatory elements) are formatted in bold font.

S6.01 The structured checklist provided below may be modified as required but with the following restrictions:

a. All standards and their respective naming conventions, definitions and value lists must be adhered to.

b. Guidelines are not mandatory but are recommendations and where used, must follow the naming conventions, definitions and value lists given in the protocol.

G6.01 The order of information and design of the checklist may be varied according to the laboratory information system (LIS) capabilities and as described in *Functional Requirements for Structured Pathology Reporting of Cancer Protocols*.20

CG6.01a Where the LIS allows dissociation between data entry and report format, the structured checklist is usually best formatted to follow pathologist workflow. In this situation, the elements of synthesis or conclusions are necessarily at the end. The report format is then optimised independently by the LIS.

CG6.01b Where the LIS does not allow dissociation between data entry and report format, (for example where only a single text field is provided for the report), pathologists may elect to create a checklist in the format of the final report. In this situation, communication with the clinician takes precedence and the checklist design is according to principles given in Chapter 7.

G6.02 Where the checklist is used as a report template (see G6.01), the principles in Chapter 7 and Appendix 2 apply

CG6.02a All extraneous information, tick boxes and unused values should be deleted.
G6.03 Additional comment may be added to an individual response where necessary to describe any uncertainty or nuance in the selection of a prescribed response in the checklist. Additional comment is not required where the prescribed response is adequate.
Item descriptions in italics are conditional on previous responses.

Values in all caps are headings with sub values.

<table>
<thead>
<tr>
<th>S/G</th>
<th>Item description</th>
<th>Response type</th>
<th>Conditional</th>
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<tbody>
<tr>
<td></td>
<td><strong>Clinical information and surgical handling</strong></td>
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<tr>
<td>S1.01</td>
<td>Demographic information provided</td>
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<td>S1.02</td>
<td>Clinical information provided on request form</td>
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<td>• Recurrence – regional</td>
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<td>• Recurrence - distant</td>
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<tr>
<td>G1.01</td>
<td>Comments</td>
<td>Text</td>
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### Macroscopic findings

<table>
<thead>
<tr>
<th>S2.02</th>
<th>Specimen labelled as</th>
<th>Text</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>G2.01</th>
<th>Operative procedure</th>
<th><strong>Single selection value list:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Not specified</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Extended thymectomy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Radical thymectomy (including anterior mediastinal lymph nodes)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Partial thymectomy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Total thymectomy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Other (specify)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>G2.02</th>
<th>Specimen weight</th>
<th><strong>Numeric</strong>: ___g</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>S2.03</th>
<th>Specimen(s) submitted</th>
<th>Not specified</th>
</tr>
</thead>
</table>

If Lymph nodes are submitted, consider recording the number.
OR

**Multi select value list (select all that apply):**
- Partial thymus
- Complete thymus
- Thymus plus surrounding tissue (radical thymectomy)
- Mediastinal pleura
- Pericardium
- Lung
  - Right
    - Wedge
    - Lobe Lobe
    - Entire Lung
  - Left
    - Wedge
    - Lobe Lobe
    - Entire Lung
- Phrenic nerve
  - Right
  - Left
- Great vessels

If separate specimens are submitted consider recording the dimensions of each in G2.04.
<table>
<thead>
<tr>
<th>G2.03</th>
<th>Lymph nodes per cassette</th>
<th><strong>Numeric</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>G2.04</td>
<td>Dimensions of thymus</td>
<td><strong>Numeric:</strong> __x__x__mm</td>
</tr>
<tr>
<td>G2.05</td>
<td>Dimensions of other submitted specimen(s)</td>
<td><strong>Numeric:</strong> __x__x__mm</td>
</tr>
</tbody>
</table>

**Note:** Repeat for each other specimen submitted.

<table>
<thead>
<tr>
<th><strong>S2.04</strong> Specimen integrity</th>
<th><strong>Single selection value list:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Cannot be assessed</td>
</tr>
<tr>
<td></td>
<td>• Surface disrupted</td>
</tr>
<tr>
<td></td>
<td>• Intact specimen</td>
</tr>
<tr>
<td></td>
<td>• Fragmented specimen</td>
</tr>
<tr>
<td>Level</td>
<td>Code</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
</tr>
</tbody>
</table>
| **S2.05** | Macroscopic site of primary tumour | Single selection value list:  
- Not specified  
- Thymic  
  - Single tumour  
  - >1 tumour  
- Ectopic (specify site(s)) | If thymic >1 tumour, consider recording the details under G2.08 |
| **S2.06** | Maximum dimension of primary tumour | Cannot be assessed  
 **OR**  
 **Numeric:** __mm | |
| **G2.06** | OTHER TUMOUR NODULE(S) | Note: Repeat for each other tumour identified.  
  | Site of tumour nodule | Text |
| | Maximum dimension | Cannot be assessed  
 **OR**  
 **Numeric:** __mm |
| | Distance to primary tumour | Cannot be assessed  
 **OR**  
 **Numeric:** __mm |
| S2.07 | Extent of tumour spread | Cannot be assessed  
OR  
**Multi select value list (select all that apply):**  
- Cannot be assessed  
- Macroscopic extension into mediastinal fat  
- Pulmonary parenchyma, specify lobe  
- Pleura, specify location  
- Pericardium  
- Diaphragm  
- Other, describe |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>G2.07</td>
<td>Closest margin to tumour</td>
<td>Text</td>
</tr>
<tr>
<td></td>
<td>Distance of tumour to closest margin</td>
<td><strong>Numeric:</strong> ___mm</td>
</tr>
<tr>
<td>G2.08</td>
<td>Appearance of non-lesional tissue</td>
<td>Text</td>
</tr>
<tr>
<td>S2.08</td>
<td>Block identification key</td>
<td>Text</td>
</tr>
<tr>
<td>G2.09</td>
<td>Other macroscopic description</td>
<td>Text</td>
</tr>
</tbody>
</table>

**Microscopic findings**

<p>| S3.01 | HISTOLOGICAL TUMOUR TYPE | Use the 2015 WHO classification. Where relevant, if more than one subtype, list in 10% increments |</p>
<table>
<thead>
<tr>
<th>Condition</th>
<th>Single selection value list:</th>
<th>If present, consider reporting the predominant subtype and other thymoma types in 10% increments.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thymoma</td>
<td>Not identified • Present</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Predominant subtype Text AND ____%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other thymoma types Text AND ____%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note: Repeat as required.</td>
<td></td>
</tr>
<tr>
<td>Thymic carcinoma</td>
<td>Not identified • Present</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Predominant subtype Text AND ____%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other thymic carcinoma patterns Text AND ____%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note: Repeat as required.</td>
<td></td>
</tr>
<tr>
<td><strong>Thymic neuroendocrine tumours</strong></td>
<td><strong>Single selection value list:</strong></td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Not identified</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Present</td>
<td></td>
</tr>
</tbody>
</table>

If present, record the percentage of Typical carcinoid tumour, Atypical carcinoid tumour, Large cell neuroendocrine carcinoma and Small cell carcinoma as applicable.

<table>
<thead>
<tr>
<th><strong>Typical carcinoid tumour</strong></th>
<th><strong>Numeric:</strong> __%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Atypical carcinoid tumour</strong></td>
<td><strong>Numeric:</strong> __%</td>
</tr>
<tr>
<td><strong>Large cell neuroendocrine carcinoma</strong></td>
<td><strong>Numeric:</strong> __%</td>
</tr>
<tr>
<td><strong>Small cell carcinoma</strong></td>
<td><strong>Numeric:</strong> __%</td>
</tr>
</tbody>
</table>

**Final histological diagnosis**  
(Use 2015 WHO classification for combined tumours)  
Text  
Report as required for complex cases.

**EXTENT OF DIRECT INVASION**

<table>
<thead>
<tr>
<th><strong>Tumour capsule</strong></th>
<th><strong>Single selection value list:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• No invasion beyond capsule or limit of the thymus</td>
</tr>
<tr>
<td></td>
<td>• Microscopic invasion</td>
</tr>
<tr>
<td></td>
<td>• Macroscopic invasion limited to the mediastinum</td>
</tr>
<tr>
<td>Body Part</td>
<td>Single selection value list:</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------------------------</td>
</tr>
</tbody>
</table>
| Mediastinal pleura | - Cannot be assessed  
- Not applicable  
- Not involved  
- Involved |
| Pericardium | - Cannot be assessed  
- Not applicable  
- Not involved  
- Involved |
| Lung (pulmonary parenchyma, visceral pleura, or both) | - Cannot be assessed  
- Not applicable  
- Not involved  
- Involved (Specify lobe(s) of the lung) |
| Innominate vein | - Cannot be assessed |

*Macroscopic invasion beyond the mediastinum*

**GREAT VESSELS**

*Report only if submitted.*
<table>
<thead>
<tr>
<th>Section</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aorta (ascending or descending)</td>
<td>Not applicable, Not involved, Involved</td>
</tr>
<tr>
<td>Superior vena cava</td>
<td>Not applicable, Not involved, Involved</td>
</tr>
<tr>
<td>Arch vessels</td>
<td>Not applicable, Not involved, Involved</td>
</tr>
<tr>
<td>Intrapericardial pulmonary artery</td>
<td>Cannot be assessed</td>
</tr>
<tr>
<td>Location</td>
<td>Text</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Phrenic nerve</td>
<td>Single selection value list:</td>
</tr>
<tr>
<td></td>
<td>- Not applicable</td>
</tr>
<tr>
<td></td>
<td>- Not involved</td>
</tr>
<tr>
<td></td>
<td>- Involved</td>
</tr>
<tr>
<td>Other involved organ(s)/site(s) by direct spread</td>
<td>Text</td>
</tr>
<tr>
<td></td>
<td>- Not identified</td>
</tr>
<tr>
<td></td>
<td>- Present</td>
</tr>
<tr>
<td>Pleural and/or pericardial</td>
<td>Single selection value list:</td>
</tr>
<tr>
<td></td>
<td>- Not identified</td>
</tr>
<tr>
<td></td>
<td>- Present</td>
</tr>
<tr>
<td>Pulmonary intraparenchymal</td>
<td>Single selection value list:</td>
</tr>
</tbody>
</table>

Note: Record each location separately

For each location(s) record the number per location

Report only if applicable specimens submitted

Note: Record only if applicable.

If present specify the location(s) and the number per location
| IC | CB | Distant organ | Single selection value list:  
| Not identified  
| Present |
| IC | CB | G3.01 Response to neoadjuvant therapy | Single selection value list:  
| Cannot be assessed  
| Prior treatment not known  
| No prior treatment  
| No response  
| Positive response |
| | | | If positive, specify % residual viable tumour on cross-section |
| IC | CB | Residual viable tumour on cross-section | Numeric: ___% |
| IC | CB | G3.02 Coexistent pathology | Multi select value list (select all that apply):  
| Thymic hyperplasia  
| Follicular  
| Epithelial  
| True  
| Cystic changes  
| In tumour  
<p>| In adjacent thymus |</p>
<table>
<thead>
<tr>
<th>S3.04</th>
<th>Margin status</th>
<th>Single selection value list:</th>
<th>If involved, record if macroscopic or microscopic</th>
</tr>
</thead>
</table>
|         |                                   | • Cannot be assessed  
|         |                                   | • Not involved  
|         |                                   | • Involved  
| G3.03   | Margins involved                  | Multi select value list (select all that apply):                                             |                                               |
|         |                                   | • Macroscopic (Specify margin(s), if possible)  
|         |                                   | • Microscopic (Specify margin(s), if possible)  
| G3.03   | LYMPH NODE STATUS                 | Single selection value list:                                                                 | If involved consider recording G3.03          |
|         |                                   | • No nodes submitted or found  
|         |                                   | • Not involved  
|         |                                   | • Involved  
| G3.03   | Involved Lymph nodes              | Multi select value list (select all that apply):                                             |                                               |
|         |                                   | • Anterior (perithymic) nodes (zone 1)  
|         |                                   | • Deep intrathoracic or cervical nodes (zone 2)  
|         |                                   | • Unspecified location within zones 1 or 2  
|         |                                   | • Location(s) outside zones 1 or 2 (M1 disease)  
|         |                                   | AND  

Number of lymph nodes examined: ____
Numeric of positive lymph nodes: ____
OR Number cannot be determined

Note: Record the number of nodes per site selected.

<table>
<thead>
<tr>
<th>G3.04</th>
<th>Additional microscopic comment</th>
<th>Text</th>
</tr>
</thead>
</table>

**Ancillary test findings**

| G4.01 | Immunohistochemical markers | Single selection value list:  
- Not performed  
- Performed |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive markers</td>
<td>Text</td>
<td></td>
</tr>
<tr>
<td>Negative markers</td>
<td>Text</td>
<td></td>
</tr>
<tr>
<td>Equivocal markers</td>
<td>Text</td>
<td></td>
</tr>
<tr>
<td>Interpretation and conclusions</td>
<td>Text</td>
<td></td>
</tr>
</tbody>
</table>

| G4.02 | Molecular studies | Single selection value list:  
- Not performed  
- Performed (specify) |
|-------|-------------------|-----------------------------------|

If performed, record the markers and interpretation ad conclusion.
<table>
<thead>
<tr>
<th>G4.03</th>
<th>Other ancillary findings</th>
<th>Text</th>
</tr>
</thead>
</table>

### Synthesis and overview

#### S5.01
**Pathologic staging for thymomas and thymic carcinomas – modified masaoka (with updated ITMIG definitions)**

#### Single selection value list:
- Not applicable
- Cannot be determined
- \( I \) - Grossly and microscopically completely encapsulated tumour
- \( I I a \) - Microscopic transcapsular invasion
- \( I I b \) - Macroscopic invasion into thymic or surrounding fatty tissue, or grossly adherent to but not breaking through mediastinal pleura or pericardium
- \( I I I \) - Macroscopic invasion into neighbouring organ (i.e. pericardium, great vessel or lung)
- \( I V a \) - Pleural or pericardial metastases
- \( I V b \) - Lymphogenous or haematogenous metastases

#### G5.01
**PROPOSED TNM PATHOLOGIC STAGING FOR THYMIC CARCINOMA**
<table>
<thead>
<tr>
<th>Suffix(es)</th>
<th>Multi select value list (select all that apply):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• m - multiple primary tumors</td>
</tr>
<tr>
<td></td>
<td>• y - post treatment</td>
</tr>
<tr>
<td></td>
<td>• r - recurrent</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary tumour (pT)</th>
<th>Single selection value list:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• T1 A tumour that either is limited to the thymus with or without encapsulation, directly invades into the mediastinum only or directly invades the mediastinal pleura but does not involve any other mediastinal structure</td>
</tr>
<tr>
<td></td>
<td>• T1a no mediastinal pleural involvement</td>
</tr>
<tr>
<td></td>
<td>• T1b direct invasion of the mediastinal pleura</td>
</tr>
<tr>
<td></td>
<td>• T2 A tumour with direct invasion of the pericardium (either partial or full-thickness)</td>
</tr>
<tr>
<td></td>
<td>• T3 A tumour with direct invasion into any of the following: Lung, brachiocephalic vein, superior vena cava, phrenic nerve, chest wall, or extrapericardial pulmonary artery or veins</td>
</tr>
<tr>
<td></td>
<td>• T4 A tumour with invasion into any of the following: aorta (ascending, arch, or descending), arch vessels, intrapericardial</td>
</tr>
<tr>
<td>Region</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Regional lymph nodes (pN)</td>
<td>Single selection value list:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Distant metastases (pM)</td>
<td>Single selection value list:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**S5.02 Year and edition of staging system**

**Text**

**G5.02 Diagnostic summary**

Include:
- Specimen submitted (S2.03)
- Tumour site (S2.05)
- Tumour type (S3.01)
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>d.</td>
<td>Tumour stage (S5.01 and G5.01)</td>
</tr>
<tr>
<td>e.</td>
<td>Completeness of excision (S3.04)</td>
</tr>
<tr>
<td><strong>S5.03</strong></td>
<td><strong>Overarching comment</strong> (if applicable)</td>
</tr>
<tr>
<td><strong>S5.04</strong></td>
<td><strong>Edition/version number of the RCPA protocol on which the report is based</strong></td>
</tr>
</tbody>
</table>
7 Formatting of pathology reports

Good formatting of the pathology report is essential for optimising communication with the clinician, and will be an important contributor to the success of cancer reporting protocols. The report should be formatted to provide information clearly and unambiguously to the treating doctors, and should be organised with their use of the report in mind. In this sense, the report differs from the structured checklist, which is organised with the pathologists’ workflow as a priority. For an example pathology report, please refer to Appendix 3.

Uniformity in the format as well as in the data items of cancer reports between laboratories makes it easier for treating doctors to understand the reports; it is therefore seen as an important element of the systematic reporting of cancer. For guidance on formatting pathology reports, please refer to Appendix 2.
Appendix 1  Pathology request information and surgical handling procedures

This appendix describes the information that should be collected before the pathology test. Some of this information can be provided on generic pathology request forms; any additional information required specifically for the reporting of Thymic Epithelial Tumours may be provided by the clinician on a separate request information sheet. An example request information sheet is included below. Elements which are in bold text are those which pathologists consider to be required information. Those in non-bold text are recommended.

Also included in this appendix are the procedures that are recommended before handover of specimens to the laboratory.

Patient information

➢ Adequate demographic and request information should be provided with the specimen.
   • Items relevant to cancer reporting protocols include:
     • patient name
     • date of birth
     • sex
     • identification and contact details of requesting doctor
     • date of request
     • The patient’s ethnicity should be recorded, if known. In particular whether the patient is of aboriginal or Torres Strait islander origin. This is in support of a government initiative to monitor the health of indigenous Australians particularly in relation to cancer.

➢ The patient’s health identifiers should be provided.
   • The patient’s health identifiers may include the patient’s Medical Record Number as well as a national health number such as a patient’s Medicare number (Australia), Individual Healthcare Identifier (IHI) (Australia) or the National Healthcare Identifier (New Zealand).

➢ The Australian Healthcare identifiers i.e. Healthcare Provider Identifier - Individual (HPI-I) and Healthcare Provider Identifier - Organisation (HPI-O) should be use, where possible, to identify the requesting doctor.

Clinical Information

➢ Clinical information should be recorded.
It is helpful to know whether the patient has myasthenia gravis or other conditions including neoplasms that can be associated with thymomas. Knowledge of any neoadjuvant treatment is also important as it may explain necrosis and scarring seen macroscopically and microscopically, and allows the pathologist to comment on histologic treatment response.

If clinical conditions other than those listed are provided, then these should be noted under ‘Other disorders’.

- The operative procedure should be documented on the request form.
- Any relevant previous biopsy or procedure should be documented on the request form.
- **Record if this is a new primary cancer or a recurrence of a previous tumour, if known.**
  - The term recurrence defines the return, reappearance or metastasis of cancer (of the same histology) after a disease free period.
    - Recurrence should be classified as distant metastases or regional (local) recurrence.
    - Regional (local) recurrence refers to the recurrence of cancer cells at the same site as the original (primary) tumour or the regional lymph nodes.
    - Distant metastasis refers to the spread of cancer of the same histologic type as the original (primary) tumour to distant organs or distant lymph nodes.
  - This information will provide an opportunity for previous reports to be reviewed during the reporting process, which may provide valuable information to the pathologist. This information also has implications for recording cancer incidence and evidence based research.

**Surgical handling**

- The specimen should be capable of orientation if the status of specific surgical margins is critical in determining the need for, or extent of, further surgery.
  - Where there are no anatomical landmarks, specimen orientation may be indicated with marking sutures or other techniques. If a specimen is orientated, the orientation should be indicated on the specimen request form (this may be facilitated by the use of a diagram).
- Identification of research sections should preferably be done in consultation with the pathologist in order to avoid compromising the diagnosis.
Example Request Information Sheet

The above Request Information Sheet is published to the RCPA website
Appendix 2  Guidelines for formatting of a pathology report

Headings and spaces should be used to indicate subsections of the report, and heading hierarchies should be used where the Laboratory Information System (LIS) allows it. Heading hierarchies may be defined by a combination of case, font size, style and, if necessary, indentation.

- Grouping like data elements under headings and using ‘white space’ assists in rapid transfer of information.74

Descriptive titles and headings should be consistent across the protocol, checklist and report.

When reporting on different tumour types, similar layout of headings and blocks of data should be used, and this layout should be maintained over time.

- Consistent positioning speeds data transfer and, over time, may reduce the need for field descriptions or headings, thus reducing unnecessary information or ‘clutter’.

Within any given subsection, information density should be optimised to assist in data assimilation and recall.

- Configuring reports in such a way that they ‘chunk’ data elements into a single unit will help to improve recall for the clinician.74
- ‘Clutter’ should be reduced to a minimum.74 Thus, information that is not part of the protocol (e.g. billing information, SNOMED codes, etc) should not appear on the reports or should be minimized.
- Injudicious use of formatting elements (e.g. too much bold, underlining or use of footnotes) constitutes clutter and may distract the reader from the key information.

Where a structured report checklist is used as a template for the actual report, any values provided in the checklist but not applying to the case in question must be deleted from the formatted report.

Reports should be formatted with an understanding of the potential for the information to mutate or be degraded as the report is transferred from the LIS to other health information systems.

As a report is transferred between systems:

- text characteristics such as font type, size, bold, italics and colour are often lost
- tables are likely to be corrupted as vertical alignment of text is lost when fixed font widths of the LIS are rendered as proportional fonts on screen or in print
- spaces, tabs and blank lines may be stripped from the report, disrupting the formatting
- supplementary reports may merge into the initial report.
Appendix 3  Example of a pathology report

THYMIC EPITHELIAL TUMOUR STRUCTURED REPORT

Diagnostic Summary

Thymus: Thymoma, WHO type B2; Modified Masaoka stage IIA; TNM stage pT2, NX, Margins clear

Supporting Information

CLINICAL
Clinical history: Myasthenia gravis, Anterior mediastinal mass.
Prev. biopsy/procedure: Nil
Operative procedure: Thymectomy
New primary tumour or recurrence: New primary

MACROSCOPIC
Specimen labelled: "Thymus"
Operative procedure: Total thymectomy
Specimen weight: 65.0g
Specimens submitted: Complete thymus
Dimensions of thymus: 110x65x35 mm
Specimen integrity: Intact specimen

TUMOUR
Macroscopic site: Thymic, single tumour
Max. dimension: 100mm
Extent of tumour spread: Confined to thymus macroscopically
Closest margin to tumour: <1mm from posterior margin

Appearance of non-lesional tissue: Unremarkable
Block identification key: A1-1D Representative sections of tumour (with closest anterior margin in A5 and A6); B1 non-lesional thymus.

MICROSCOPIC:
Histologic tumour type:
Thymoma:
Present
Predominant type:
WHO type B2, 100%
Other thymoma types:
0%
Thymic carcinoma:
Not identified
Thymic neuroendocrine tumours:
Not identified

The data fields within this formatted report adhere to criteria set out in the ARO document "THYMIC EPITHELIAL TUMOURS STRUCTURED REPORTING PROTOCOL 1st ED. 2016."
EXTENT OF INVASION

Tumour capsule: Microscopic invasion through tumour capsule.
Mediastinal pleura: Not involved.
Pericardium: Not applicable.
Lung (pulmonary parenchyma, visceral pleura, or both): Not applicable.
Phrenic nerve: Not involved.

Coexistent pathology: The non-neoplastic thymus shows thymic hyperplasia with follicle formation.

Margin status: Not involved. The tumour is 1mm from the closest margin (anterior).

Lymph node status: No lymph nodes submitted or found.

ANCILLARY TESTS

Immunohistochemical markers: Performed.
Positive markers: Cytokeratin expression is present in the epithelial component. The lymphoid cells express CD3 and TdT.

Negative markers: CD20.

Equivocal markers: Nil

Interpretation and conclusions: In keeping with type B2 thymoma.

Molecular data: Not performed

Reported by Dr. Sarah Nguyen

Authorised 4/4/2016

The data fields within this formatted report adhere to criteria as set out in the RCPath document "THYMIC EPITHELIAL TUMOURS STRUCTURED REPORTING PROTOCOL 1st ed. 2016."
# Appendix 4  WHO Classification of Tumours

WHO classification of tumours of the thymus\textsuperscript{a,b}

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>ICD0 codes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Epithelial tumours</strong></td>
<td></td>
</tr>
<tr>
<td>Thymoma</td>
<td></td>
</tr>
<tr>
<td>Type A thymoma, including atypical variant</td>
<td>8581/3*</td>
</tr>
<tr>
<td>Type AB thymoma</td>
<td>8582/3*</td>
</tr>
<tr>
<td>Type B1 thymoma</td>
<td>8583/3*</td>
</tr>
<tr>
<td>Type B2 thymoma</td>
<td>8584/3*</td>
</tr>
<tr>
<td>Type B3 thymoma</td>
<td>8585/3*</td>
</tr>
<tr>
<td>Micronodular thymoma with lymphoid stroma</td>
<td>8580/1*</td>
</tr>
<tr>
<td>Metaplastic thymoma</td>
<td>8580/3</td>
</tr>
<tr>
<td>Other rare thymomas</td>
<td></td>
</tr>
<tr>
<td>Microscopic thymoma</td>
<td>8580/0</td>
</tr>
<tr>
<td>Sclerosing thymoma</td>
<td>8580/3</td>
</tr>
<tr>
<td>Lipofibroadenoma</td>
<td>9010/0*</td>
</tr>
<tr>
<td>Thymic carcinoma</td>
<td></td>
</tr>
<tr>
<td>Squamous cell carcinoma</td>
<td>8070/3</td>
</tr>
<tr>
<td>Basaloid carcinoma</td>
<td>8123/3</td>
</tr>
<tr>
<td>Mucoepidermoid carcinoma</td>
<td>8430/3</td>
</tr>
<tr>
<td>Lymphoepithelioma-like carcinoma</td>
<td>8082/3</td>
</tr>
<tr>
<td>Clear cell carcinoma</td>
<td>8310/3</td>
</tr>
<tr>
<td>Sarcomatoid carcinoma</td>
<td>8033/3</td>
</tr>
<tr>
<td>Adenocarcinomas</td>
<td></td>
</tr>
<tr>
<td>Papillary adenocarcinoma</td>
<td>8260/3</td>
</tr>
<tr>
<td>Thymic carcinoma with adenoid cystic carcinoma-like features</td>
<td>8200/3</td>
</tr>
<tr>
<td>Mucinous adenocarcinoma</td>
<td>8480/3</td>
</tr>
<tr>
<td>Adenocarcinoma, NOS</td>
<td>8140/3</td>
</tr>
<tr>
<td>NUT carcinoma</td>
<td>8023/3*</td>
</tr>
<tr>
<td>Undifferentiated carcinoma</td>
<td>8020/3</td>
</tr>
<tr>
<td>Other rare thymic carcinomas</td>
<td></td>
</tr>
<tr>
<td>Adenosquamous carcinoma</td>
<td>8560/3</td>
</tr>
<tr>
<td>Hepatoid carcinoma</td>
<td>8576/3</td>
</tr>
<tr>
<td>Thymic carcinoma, NOS</td>
<td>8586/3</td>
</tr>
<tr>
<td><strong>Thymic neuroendocrine tumours</strong></td>
<td></td>
</tr>
<tr>
<td>Carcinoid tumours</td>
<td></td>
</tr>
<tr>
<td>Typical carcinoid</td>
<td>8240/3</td>
</tr>
<tr>
<td>Atypical carcinoid</td>
<td>8249/3</td>
</tr>
<tr>
<td>Large cell neuroendocrine carcinoma</td>
<td>8013/3</td>
</tr>
<tr>
<td>Combined large cell neuroendocrine carcinoma</td>
<td>8013/3</td>
</tr>
<tr>
<td>Descriptor</td>
<td>ICD0 codes</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Small cell carcinoma</td>
<td>8041/3</td>
</tr>
<tr>
<td>Combined small cell carcinoma</td>
<td>8045/3</td>
</tr>
</tbody>
</table>

**Combined thymic carcinomas**

a The morphology codes are from the International Classification of Diseases for Oncology (ICD-O). Behaviour is coded /0 for benign tumours; /1 for unspecified, borderline, or uncertain behaviour; /2 for carcinoma in situ and grade III intraepithelial neoplasia; and /3 for malignant tumours.
b The classification is modified from the previous WHO classification, taking into account changes in our understanding of these lesions.
* These new codes were approved by the IARC/WHO Committee for ICD-O.

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Appendix 5  Masaoka-Koga Staging System

ITMIG Definition of Details of the Masaoka-Koga Staging System
Stage Definition (the ITMIG interpretation of details is in italics)

I  Grossly and microscopically completely encapsulated tumour
This includes tumours with invasion into but not through the capsule, or ...
Tumours in which the capsule is missing but without invasion into
surrounding tissues

II a  Microscopic transcapsular invasion
Microscopic transcapsular invasion (not grossly appreciated)

b  Macroscopic invasion into thymic or surrounding fatty tissue, or
grossly adherent to but not breaking through mediastinal pleura or
pericardium
Gross visual tumour extension into normal thymus or perithymic fat
surrounding the thymoma (microscopically confirmed), or ...
Adherence to pleura or pericardium making removal of these structures
necessary during resection, with microscopic confirmation of perithymic
invasion (but without microscopic extension into or through the
mediastinal pleura or into the fibrous layer of the pericardium)

III  Macroscopic invasion into neighbouring organ (i.e. pericardium,
great vessel or lung)
This includes extension of the primary tumour to any of the following
tissues:
Microscopic involvement of mediastinal pleura (either partial or penetrating
the elastin layer); or ...
Microscopic involvement of the pericardium (either partial in the fibrous
layer or penetrating through to the serosal layer); or ...
Microscopically confirmed direct penetration into the outer elastin layer of
the visceral pleura or into the lung parenchyma; or ...
Invasion into the phrenic or vagus nerves (microscopically confirmed,
adherence alone is not sufficient); or ...
Invasion into or penetration through major vascular structures
(microscopically confirmed);
Adherence (i.e. fibrous attachment) of lung or adjacent organs only if
there is mediastinal pleural or pericardial invasion (microscopically
confirmed)

IV a  Pleural or pericardial metastases
Microscopically confirmed nodules, separate from the primary tumour,
involving the visceral or parietal pleural surfaces, or the pericardial or
epicardial surfaces,

b  Lymphogenous or hematogenous metastasis
Any nodal involvement (e.g. anterior mediastinal, intrathoracic, low/anterior cervical lymph nodes, any other extrathoracic lymph nodes) Distant metastases (i.e. extrathoracic and outside the cervical perithymic region) or pulmonary parenchymal nodules (not a pleural implant)
References


RCPA (Royal College of Pathologists of Australasia) (2009 ). Guidelines for Authors of Structured Cancer Pathology Reporting Protocols. RCPA, Surry Hills NSW.


