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REVIEW

Neck dissections: A practical guide for the reporting histopathologist

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Summary This paper outlines types of surgical neck dissection and describes practical aspects of producing an accurate histopathological assessment and report.
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Introduction

This article covers the pathological assessment of neck dissections (NDs) performed for mucosal squamous cell carcinoma (SCC) of the oral cavity, pharynx and larynx and salivary gland malignancies.

The multiple classifications and terminology associated with NDs are mainly based on clinical and surgical factors, but the reporting pathologist should be familiar with the terms used on Pathology Request Forms and at Multidisciplinary Team Meetings (MDTs).

Based on the indication, NDs may be described as therapeutic or elective depending on whether or not there is clinical/radiological suggestion of metastasis. Salvage NDs are carried out for late-presenting or recurrent disease.

NDs may be performed simultaneously with resection of the primary tumour, and simultaneous NDs may or may not be in continuity with the primary resection.

NDs may be unilateral or bilateral procedures. The terms ''ipsilateral'' and ''contralateral'' may be used to describe laterality in relation to the site of the primary tumour. It is easiest if the pathologist considers a bilateral procedure as two separate NDs and refers to them as ''right ND'' and ''left ND''.

The classification of NDs according to their extent can be confusing but the following scheme has been suggested:

1. ''Radical (classical) ND'' refers to the original procedure[1] in which cervical lymph node anatomical levels I–V (see below for a detailed

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anatomical definition of the anatomical levels) are removed en bloc with the internal jugular vein (IJV), the sternocleidomastoid muscle (SCM) and the spinal accessory nerve.
2. ''Extended RNDs'' include additional structures such as the skin.
3. In ''function-preserving NDs'', anatomical structures such as the IJV and SCM are not included. Depending on which anatomical nodal levels are included, function-preserving NDs may be: (a) ''comprehensive'' (also called modified radical ND and Bocca procedure), which include anatomical levels I–V and (b) ''selective'' procedures, which remove those nodal levels at highest risk of metastasis. For example, selective ND for oral cavity cancer as defined by Robbins et al. includes levels I–III (with the junction between the superior belly of the omohyoid muscle and the IJV forming the inferior limit); or in the case of oral tongue cancer, levels I–IV (also known as the extended supraomohyoid ND or anterolateral ND).[2]
4. We suggest that the pathologist adopts the simple system of describing NDs by the anatomical levels included (levels I–III, I–IV, I–V, levels II–IV, etc.).

Topography, terminology and some theoretical considerations of cervical lymph node metastases

The six main cervical anatomical nodal levels are detailed by Robbins et al.[2] and summarised in Table 1 and Plate 1, Figure 1. An example of a surgical specimen including a level I–III right ND is illustrated in Figure 2.

Lymph node metastasis in SCC and salivary gland malignancies involves embolic spread with emboli entering the lymph node via afferent lymphatics and traversing the capsule where they may settle, sometimes around valves, as a capsular (or juxtacapsular) embolus (Figure 3); or enter the node proper via the marginal, cortical and medullary sinuses. The embolus must settle and establish a vascular stroma in order to develop into a metastatic deposit.

In any single node, emboli of tumour cells totalling not more than 0.2 mm in greatest dimension (seen in HE-stained sections or on immunohistochemistry) are defined as isolated tumour cells (ITC).[3] Tumour deposits between 0.2 and 2 mm are termed micrometastases[4] (Figure 4) and usually show evidence of successful settling and growth (mitotic activity, stromal reaction). When the profile diameter of the tumour deposit(s) exceeds 2 mm in total, the term conventional metastasis applies. ''Covert'' metastases are not suspected clinically or radiologically and may be ITC, micrometastases or conventional metastases.

In the majority of cases, the metastatic tumour develops initially in one or more lymph nodes directly draining the lymphatic basin of the primary tumour (see Table 1), and then progresses in an orderly ''overflow'' fashion to produce an ''inverted-cone'' shape where the disease is maximal within the first echelon of nodes with a gradual spread to successive levels.[5] In around 30% of oral tongue tumours, 20% of floor-of-mouth tumours and 10% of oropharyngeal tumours with metastases, simultaneous involvement of multiple drainage routes can result in the appearance of ''skip'' metastases and/or ''peppering'' of nodes at multiple anatomical levels.[5,6] Metastasis in a node at level I and a node at level IV without evidence of metastasis at levels II and III is an example of a skip lesion from a tumour of the anterior oral tongue or floor of mouth. ''Peppering'' denotes micrometastasis in multiple nodes in the absence of a conventional metastasis. Once established within the lymph node, the tumour deposit(s) grow(s) at variable rate to replace the lymphoid parenchyma. Even before the total lymph node is replaced, SCC often shows extracapsular (extranodal) spread (ECS). It is present in 70% of oropharyngeal tumours with metastasis.[5,6]

In addition to the main six levels of cervical nodes, other nodal groups may be involved in salivary gland malignancies and less commonly, SCCs.

1. The parotid lymph nodes will usually be removed by total or partial parotidectomy often in continuity with the ND. The 20 (range 10–35) parotid nodes are round or bean-shaped, <10 mm and are subdivided into extraglandular (pre-auricular and infra-auricular) and intraglandular groups.
2. Facial nodes (mandibular, buccal, infra-orbital and malar) are bean-shaped, <10 mm and are involved in around 15% of retromolar tumours with metastases, and less frequently, in alveolar and buccal tumours.[6]
3. Sublingual and lingual nodes, inconstant small nodes (up to four) associated with the sublingual glands and midline lingual raphe (Figure 5), are very occasionally involved in oral tongue and floor-of-mouth tumours.[7,8]
4. Retropharyngeal nodes are occasionally involved by nasopharyngeal and oropharyngeal tumours.

Table 1 Cervical lymph nodes—anatomical levels and nodal characteristics.

Anatomical level	Boundaries	Usual no. of nodes	Nodal characteristics	Principal drainage basin
Sublevel IA, submental	Within the submental triangle between the anterior bellies of the digastric muscles and the hyoid bone.	3–4	Spherical, <10 mm	Lower lip, anterior lower alveolar ridge, anterior floor of mouth, tip of tongue.
Sublevel IB, submandibular	Within the boundaries of the anterior belly of digastric, stylohyoid and body of mandible, close to the submandibular salivary gland and facial artery.	3–7	Round, flattened, <18 mm	Submental and facial nodes. Labial and buccal mucosae, palate, oral tongue, floor of mouth.
Level II, upper jugular; level IIA; level IIB	Located around the upper 1/3 of the internal jugular vein and adjacent spinal accessory nerve extending from the level of the skull base to the inferior border of the hyoid bone, and from the stylohyoid muscle to the posterior border of the sternocleidomastoid muscle. Anterior to the spinal accessory nerve. Posterior to the spinal accessory nerve.	10–20	Bean-shaped, <25 mm Ill-defined, flat, round or bean-shaped, 3-20 mm	Submental, submandibular, occipital, posterior auricular, parotid and retropharyngeal nodes. Oral and nasal cavities, pharynx, larynx, parotid gland.
Level III, middle jugular	Around the middle 1/3 of the internal jugular vein, at the level of the bifurcation of the common carotid artery, extending from the inferior border of the hyoid bone to the inferior border of the cricoid cartilage.	5–10	Long, slender, flat, <20 mm	Upper jugular nodes. Mid-portion of oral tongue.
Level IV, lower jugular	Around the lower 1/3 of the internal jugular vein where the anterior belly of omohyoid crosses the internal jugular vein, extending from the inferior border of the cricoid cartilage to the clavicle.	5–10	Bean-shaped and spherical, <25 mm	Upper and middle jugular nodes. Tip of tongue, anterior floor of mouth, hypopharynx, thyroid, cervical oesophagus and larynx.
Level V, posterior triangle; sublevel VA; sublevel VB	Extends from the apex formed by the convergence of the sternocleidomastoid and trapezius muscles, the clavicle, posterior border of sternocleidomastoid and anterior border of trapezius. Spinal accessory nodes, above inferior border of cricoid notch. Transverse cervical and supraclavicular nodes.	20–30	Flat, round and bean-shaped, <15 mm	Occipital and posterior auricular nodes. Naso and oropharynx, skin of scalp and neck.
Level VI; anterior compartment	Pretracheal and paratracheal, precricoid and perithyroidal nodes. Extends from hyoid bone, sternal notch, common carotid artery.	10–20	Small, ovoid, <10 mm	Thyroid gland, glottic and subglottic larynx, apex of pyriform sinus, cervical oesophagus.

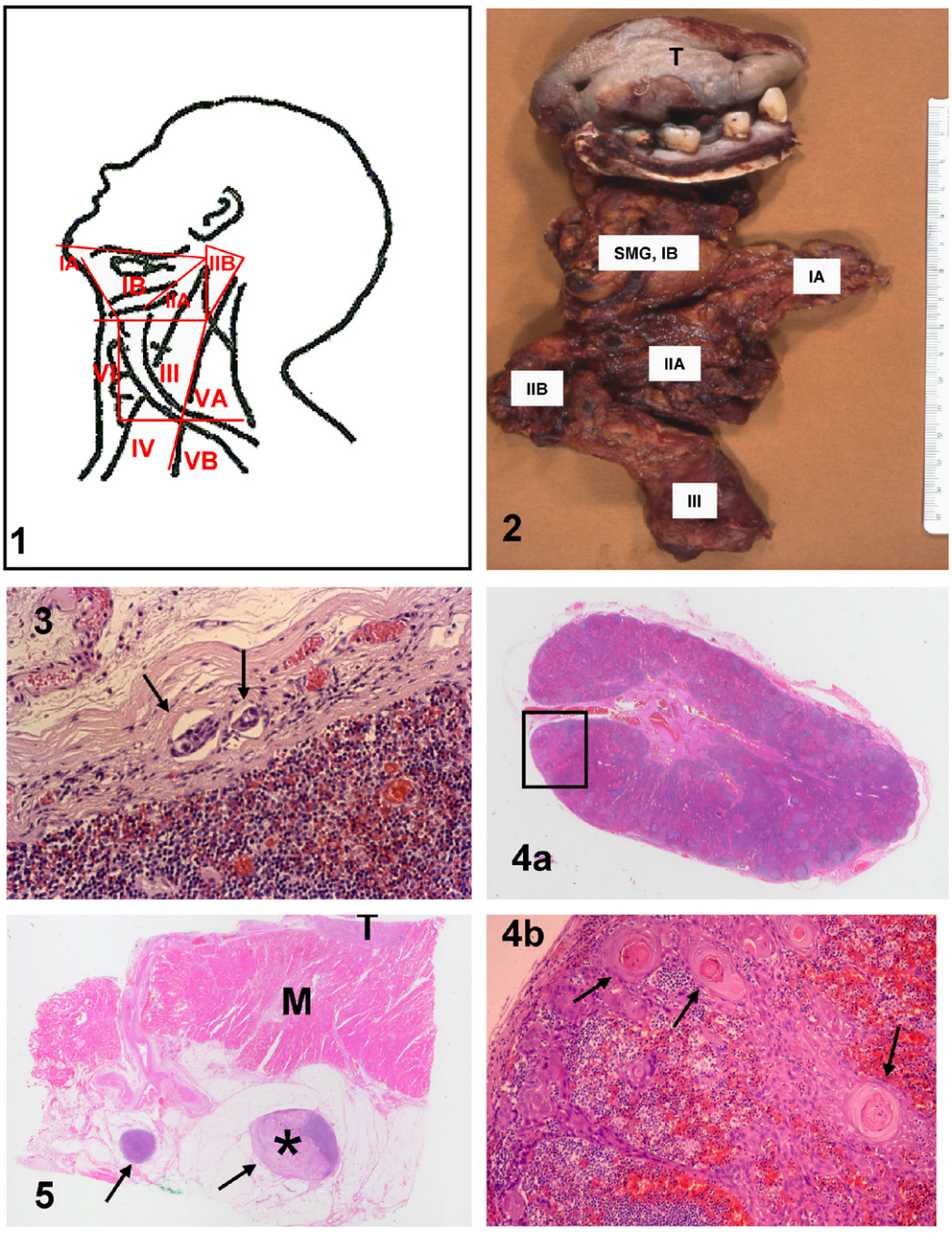


Plate 1 Figure 1. The six levels of the neck. Figure 2. Right selective neck dissection for an SCC of the lateral border of the tongue (T), which includes levels IA, IB, IIA, IIB and III. The submandibular salivary gland (SMG) is readily identified. The dissection also includes partial resection of the mandibular alveolar process with cuspid, second premolar, and second and third molars left *in situ*. Figure 3. Lymphatic embolism in a cervical lymph node. Groups of coherent carcinoma cells (arrows) have been transported in the lymph stream to the capsule of the node. Subcapsular sinuses are incospicuous. Figure 4. A cervical lymph node. (a) The area enclosed in rectangle contains a micrometastasis of SCC. The tumour deposit is very difficult to distinguish at low magnification and easily overlooked if examination is cursory. (b) Higher magnification, allowing the recognition of typical keratin pearls (arrows) in the haemorrhagic nodal parenchyma. Figure 5. Mid-line lymph nodes. Sagittal section of floor of mouth showing, from top to bottom, a mucosal SCC (T), musculature (M) and adipose tissue that contains the nodes (arrows). The larger node contains an extensive metastatic deposit (asterisk). The chromatic contrast between the deposit and surviving nodal parenchyma is obvious. The deposit does not spread to adjacent fat and the nodal contour seems preserved.

Simultaneous bilateral metastases are seen in 15–20% of floor-of-mouth, oral tongue and pharyngeal tumours with metastasis.[5,6]

Specimen presentation

Close co-operation and good communication between the surgical team and the reporting pathologist are essential.

In order for the pathologist to visualise the cervical lymph nodes in their correct anatomical relationships, the surgical team must pin out the ND specimen prior to fixation. The specimen can be pinned or sutured to a cork or polystyrene tile with the outer (superficial) aspect uppermost. In function-preserving dissections lacking anatomical landmarks, a suture or tag should be placed at the centre of each anatomical nodal level. A simple line diagram or labelled photograph should be submitted with the Pathology Request Form if the request form does not include a pre-printed diagram.[9] Following orientation and labelling, the specimen and its supporting tile should be inverted into a container full of a formaldehyde-based solution for 24–48 h. It may be necessary to suggest simple tips to the trainee surgical staff—such as not allowing the specimen to dry out prior to fixation, not to use overtight sutures that may lead to tearing of the specimen and delay fixation of the deep aspect of the dissection.

An acceptable alternative method of specimen presentation is for the surgical team to divide the ND into its component anatomical levels and then place each nodal level in a separate container.[10] A suture can be used to indicate the orientation of the tissue. However, caution should be used when the ND is in continuity with the resection of the primary tumour, as attempts to divide levels I and II nodes may disrupt the integrity of the primary tumour resection.

Macroscopic assessment, harvesting and trimming of lymph nodes

The macroscopic assessment begins with a description of the type of ND and the component structures. It is helpful to follow a system—orientate the specimen then begin with the outer aspect and then the deep aspect.

In a standard radical ND, from the outer aspect, identify (and measure) the submandibular salivary gland at the anterosuperior corner, the broad SCM crossing diagonally, the omohyoid muscle protruding from the lower end of the SCM, the external jugular vein and the spinal accessory nerve crossing the SCM, and the tail of the parotid gland around the superior cut end of the SCM. Additional structures may be included such as skin or the stylohyoid and digastric muscles, or the complete parotid gland. From the deep aspect, identify the IJV running from superior to inferior—this may not be immediately apparent if it is collapsed. If enlarged nodes or tumour are visible on the surface of the specimen, the area should be inked to facilitate assessment of the surgical boundaries.

Lymph nodes are identified by inspection and palpation using the gloved fingers to sense resistant nodules within the soft adipose tissue. Increasing the fixation time beyond 24 h makes nodes more palpable. Larger nodes can generally be easily identified but smaller nodes, particularly those in level V may resemble adipose tissue in colour and it is advisable to process any uncertain material since histology often reveals small nodes within adipose tissue. Knotted suture material (for example, tying off vessels) may simulate a nodule but close inspection usually reveals their identity. It is important to work methodically. One method is to begin with level I, then level V since both these levels can be easily separated off from the SCM and dealt with individually; then proceed to levels IV, III and II working from the deep aspect using the surgeon's markers and/or anatomical structures as guides to the limits of the three jugular levels.

Each discrete node is dissected out with the attached pericapsular adipose tissue. Larger nodes (around 10 mm or more) should be bisected or sliced through the hilum parallel to the long axis. If there is obvious metastatic tumour, the half/slice with the more extensive deposit should be processed, together with the perinodal tissues (the IJV, SCM, submandibular salivary gland as appropriate) showing the extent of extracapsular spread.

In the case of matted nodes, the mass should be measured and sliced and an estimate made of the number of component nodes, processing the blocks showing the peripheral extent. Some involved nodes/nodal masses will be cystic and care is necessary to record the maximum profile diameter of the tumour including the cyst lumen and to select the tissue blocks showing the cyst wall/peripheral extent of the tumour.

If the node appears fixed to the IJV, slices showing the relation should be included—since the adherence may be due to fibrosis rather than tumour. Any areas with suspected ulceration of the intima/thrombosis should be processed.

If the node appears negative, both halves should be processed. Re-slicing the bisected node at 90° to create multiple hemispherical sections permits the

assessment of greater areas of the subcapsular sinuses.

Small or flat nodes should be processed whole, and several nodes (from the same anatomical level) can be processed in the same cassette.

When labelling cassettes, it is helpful to develop a system. For example, using different identifying letters for each anatomical level (A for level I, B for level II, etc.), followed by a number for each cassette containing a node or collection of small nodes (A1, A2, etc.). It is important to keep a note of whether the node has been bisected or sliced, especially if several cassettes are needed for the same node. Added care at this stage facilitates later stages of the assessment and report writing.

A similar method of dissection and nodal harvest can be employed for selective NDs. These are often easier to deal with since the lymph nodes are not obscured by other anatomical structures and the extent of metastasis is usually minimal.

Salvage NDs can be difficult to orientate and are often distorted by fibrosis. Tumour may not be macroscopically distinguishable from scar tissue and it is better to embed multiple slices of any doubtful tissue.

The macroscopic documentation should include, for every level, the number of harvested nodes, the diameter of the largest node and the macroscopic suspicion of tumour and extracapsular spread.

An alternative method of harvesting lymph nodes is to slice the contents of each anatomical level into 2–3 mm thick blocks with the nodes in situ, and embed and section each block for histological assessment. This produces a good nodal yield and good detection of small tumour deposits[10] but caution and concentration are essential in order to "reconstruct" nodes appearing in multiple blocks and hence, avoid exaggerating the number of nodes and the number of metastases.

Clearing techniques employing fat solvents[11] can be used to make the adipose tissue transparent and hence, facilitate nodal detection and harvest but these techniques are too time-consuming for routine use.

A radical ND generally yields around 40 lymph nodes, and a levels I–IV dissection around 30 nodes.[5,6] The precise number varies depending on the patient's age, the extent of metastasis, previous radiotherapy, and so on.

Histological assessment

In the routine diagnostic service, it is necessary to balance the thoroughness of the assessment against the available resources. The compromise that is widely accepted is to assess a single HE-stained section from each tissue block and to use step-serial sections and/or immunohistochemistry (IHC) in selected cases. Assessment of the sentinel node is a special situation that is dealt with below. "Selected cases" may be to distinguish between a micrometastasis and a conventional metastasis, to assess the extent of extracapsular spread or to confirm the epithelial nature of a suspicious area (see pitfalls).

Each slide should be scanned at low power paying particular attention to the nodal sinuses. Suspected tumour deposits should be examined at higher magnification to confirm their epithelial nature. The site, solid or cystic nature and the profile diameter of the tumour deposits should be recorded (Plate 2, Figures 6–11). Deposits confined to the node may be subcapsular or central.[12] The profile diameter of the tumour in each positive node needs to be determined with reasonable accuracy since it influences the diagnosis of micrometastases as defined above and the pN category of conventional metastases. If there are multiple islands of tumour visible in a single node, the conventional way is to add the diameters of the individual tumour islands rather than including the intervening nodal parenchyma. However, this may not be possible when the tumour is seen as single cells or multiple small islands (Plate 3, Figure 12). In such cases, an approximation of the involved profile diameter based on the total area of nodal parenchyma involved by the tumour is used. It may be necessary to use the macroscopic dimension in nodes showing expansion and cystic change.

The assessment of extracapsular spread (ECS)

Accurate detection of ECS is essential since its presence is a criterion for post-operative radiotherapy and an important predictor of regional relapse and SCC-related death.[13–16]

ECS may occur in small nodes, or nodes with tumour deposits of less than 2 mm when the tumour deposit is located in the capsular or subcapsular sinuses or peripheral cortex.

Extensive ECS is usually obvious at the macroscopic stage of the assessment but it should be confirmed histologically. A simple way of recording the extent of unequivocal ECS is by reference to the tissues and structures involved:

1. Perinodal adipose tissue.
2. Blood vessels such as the facial vessels and the IJV and carotid artery—this may be confined to

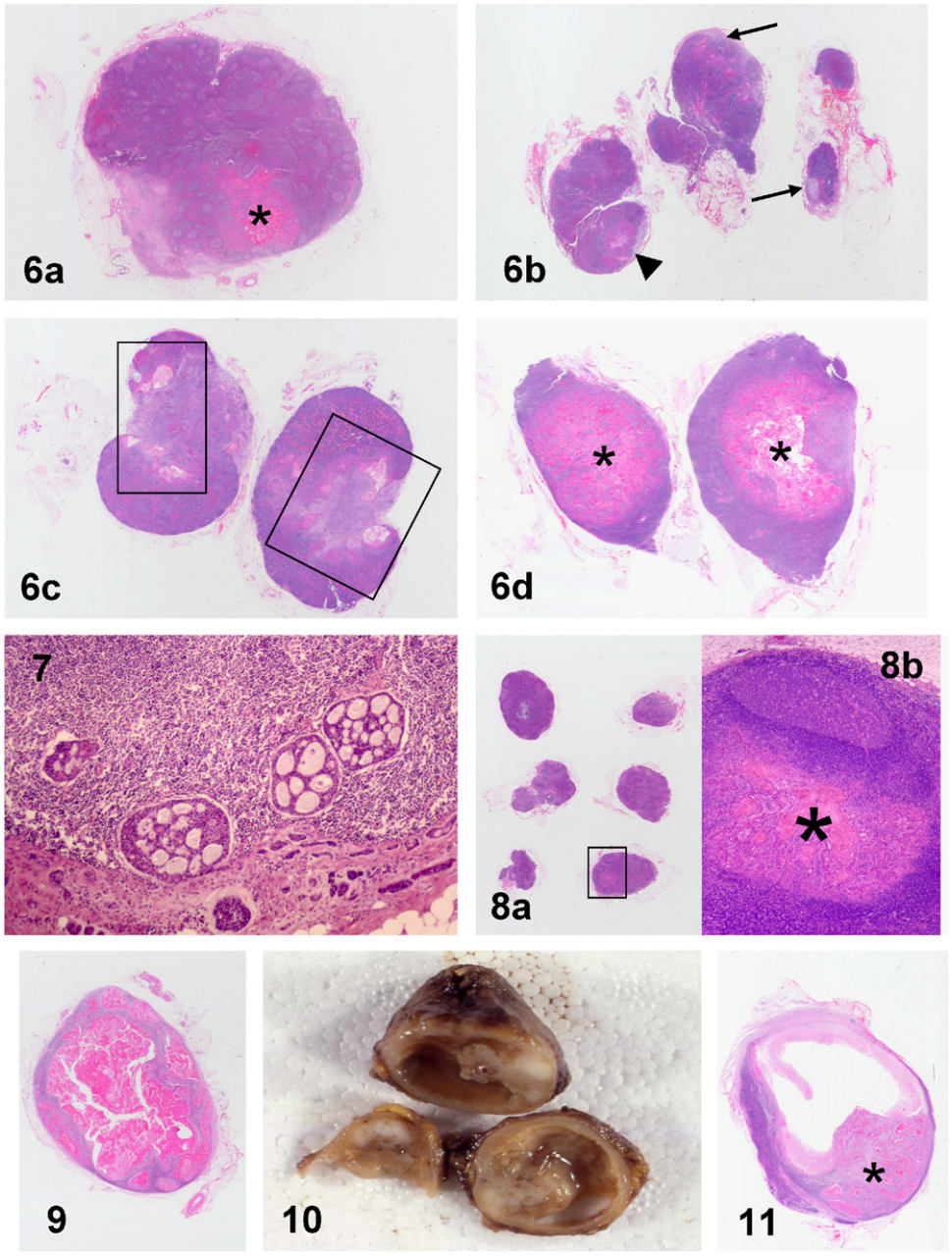


Plate 2 Figure 6. Topography of metastatic squamous cell carcinoma in cervical lymph nodes. (a) An eosinophilic tumour deposit that contrasts strikingly with the haematoxyphile lymphoid tissue is located in the cortex. (b) Nodal section profiles, three of which show cortical tumour deposits. One of the deposits (arrowhead) is eosinophilic, whereas the remainder appear pale (arrows) because of accompanying stromal reaction. See Figure 16. (c) The areas enclosed in rectangle contain tumour deposits round the hilum of a longitudinally bisected node. (d) Another node bisected lengthwise. Here, the keratinised tumour deposit (asterisks) replaces most of the medulla. Figure 7. Metastatic adenoid cystic carcinoma in the capsule and parenchyma of a cervical lymph node. Figure 8. (a) One of the six nodal section profiles contains a deposit of metastatic SCC (area enclosed in rectangle). Note the small diameter of the profiles, which illustrates the necessity of identifying, dissecting and histologically processing of even the smallest cervical lymph nodes. (b) Higher magnification to show details of the deposit (asterisk). It is keratinised and moulded to a follicle. The germinal centre of the latter is seen in the upper part of the picture. Figure 9. Most of the parenchyma of a cervical lymph node has been replaced by a heavily keratinised deposit of SCC. Surviving lymphoid foci are discernible on the periphery of the node. Figure 10. Cystic metastasis in a cervical lymph node. The node has been trisected and the appearances simulate a saccule. The cystic space is thick-walled and has a variably irregular lining that corresponds with surviving tumour and/or nodal parenchyma. See Figure 11. Figure 11. As in the case illustrated in Figure 9, most of the nodal parenchyma has been replaced by metastatic SCC. Here, however, the deposit underwent central necrosis and cystic change. The asterisk indicates surviving tumour. The features account for the appearances in Figure 10 and the notion of "branchial carcinoma".

the outer sheath or involve the various layers of the vessel wall, or there may be full thickness involvement with intimal ulceration and thrombosis.
3. The fascia of striated muscle or the muscle itself, most commonly the digastric and SCM.
4. Salivary gland parenchyma. For example, involvement of the submandibular gland is a particularly poor prognostic feature.
5. The mandible—either the periosteum or the bone.

Another useful way of recording the extent is by estimating the distance (in mm) from a reconstruction of the original position of the node capsule.

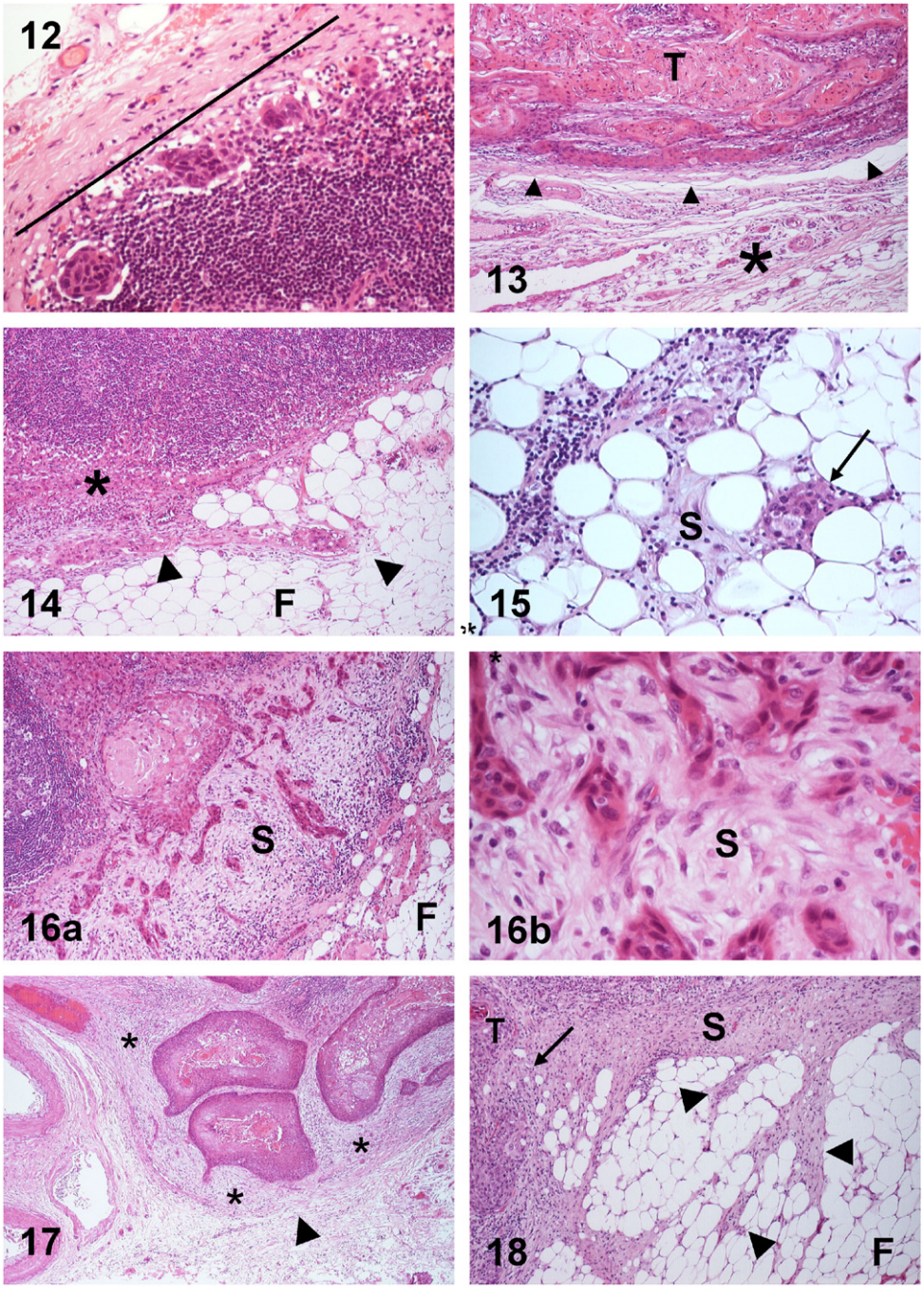
The number of nodes at each anatomical level showing extracapsular spread and the greatest extent at each level should be recorded.

Nodules of tumour may be evident within the connective tissue of a lymph drainage area without histological evidence of residual lymph node structure. The UICC[4] recommends that these should be classified as a nodal metastasis if the nodule has the form and smooth contour of a lymph node, and as venous invasion (V category) or a discontinuous extension of the primary tumour (T category) if the contour is irregular. In practical terms, the distinction becomes significant when the neck is otherwise pN0 because of the effect on staging. For example, a single tumour nodule deep to a floor-of-mouth primary tumour, if smooth, should be categorised as metastasis to a sublingual node, and if irregular, it should be categorised as venous invasion or discontinuous extension of the primary tumour. More commonly, tumour nodules are multiple and present in association with obvious nodal metastases and ECS. In such cases, the number of positive nodes may already be uncertain due to matting and a rough estimate of the number of nodules thought to represent replaced nodes is sufficient particularly if preceded by the words ''at least''.

ECS may be only focal—for example, at the hilum—or more widespread. The diagnosis of early or microscopic ECS is often challenging (Plate 3, Figures 13–18, Plate 4, Figure 19). Peripherally located or subcapsular tumour may abut onto the node capsule and may be accompanied by stromal reaction (desmoplasia). When a single node is suspicious for ECS and there is no obvious ECS elsewhere in the ND, additional step-serial sections should be examined. If these do not reveal unequivocal ECS, then it is probably safe to regard the tumour as confined to the node. If there is bulging of the node with a microscopic hump or hillock of tumour or tumour stroma, we record this as ECS confined to the immediate pericapsular tissues. Evaluation of the cellularity of the tumour stroma and the capsule is helpful in distinguishing the two situations. We do not find special stains such as EHVG offer additional information.

Emboli of tumour or ITC within the capsular sinuses or within the perinodal lymphatic vessels do

Plate 3 Figure 12. Four emboli of coherent carcinoma cells are seen in the subcapsular sinus of a cervical lymph node. They should be measured as a single tumour deposit, the diameter of which corresponds to the line segment. Figure 13. Heavily keratinised deposit of metastatic SCC (T) abuts on the fibrous capsule (arrowheads) of a cervical lymph node. Although the capsule is very thin, the deposit is still confined to the node and does not spread to perinodal soft tissues (asterisk). Figure 14. SCC permeates, from left to right, the subcapsular sinus (asterisk) and afferent lymphatic (arrowheads) that routes through the adipose tissue (F) round a cervical lymph node. The features could be misinterpreted as extracapsular spread to perinodal fat. Compare with Figure 20. Figure 15. The arrow indicates a minute collection of carcinoma cells infiltrating the perinodal fat in a cervical lymph node. A myxoid and fibroblastic focus (S), reflective of stromal reaction accompanying the infiltrating tumour, is nearby. Infiltration of the perinodal fat at various distances by tumour elements, alone or in conjunction with stromal reaction, is a most reliable criterion of extracapsular spread (see Figure 18). Such infiltration could be gross, readily identified at scanning magnification or, as in the present instance, detected at higher magnification. Figure 16. Same specimen as Figure 6b. The picture illustrates one of the ''pale'' metastatic tumour deposits. Stromal reaction is florid (S) and accounts for the, overall, ''paleness'' of the deposit. Although the contour of the node seems preserved, capsule and sinuses have been obliterated, and tumour and stromal reaction encroach on perinodal fat (F). This qualifies as extracapsular spread. (b) Detail of the stromal reaction. It comprises numerous plump fibroblasts set in palely stained myxoid matrix with little or no collagen. These features suggest that the reaction is at an early stage of development and there are no obvious attempts at organisation. Note the intimate relationship between fibroblasts and spiky islets of tumour cells, there being no obvious basement membrane between them. Figure 17. Deposits of metastatic SCC surrounded by florid early stromal reaction (asterisks), protrude into the soft tissues surrounding a cervical lymph node. Although adipocytes are not seen in these tissues, the bulging (arrowhead) of tumour elements and accompanying stromal reaction out of the nodal contour qualifies as extracapsular spread. Figure 18. Metastatic keratinising SCC (T) in a cervical lymph node shows extracapsular spread (arrow). The florid stromal reaction (S) that accompanies the tumour deposits extends as tongues and finger-like projections (arrowheads) to the adipose tissue (F) round the node. Such extension also qualifies as extracapsular spread. Compare with Figure 21.



not constitute ECS (Figure 20), but they should be noted since they appear to have additional prognostic value.[17] The clinical significance of inflammatory foci adjacent to perinodal lymphatics is uncertain (Figure 21).

Marking the slide label with the tumour dimension and an arrow to indicate ECS on each slide at the time of the histological assessment expedites the report writing, later retrieval of slides for MDTs, etc.

Sentinel node biopsy

The use of sentinel node biopsy for head and neck SCC is currently under active evaluation by prospective clinical trials.[18] The potential applications and the benefits and pitfalls are summarised in recent reviews.[19,20] In ipsilateral and contralateral N0 necks, the sentinel node can be identified by a combination of lymphoscintigraphy and injection of a blue dye and into the tumour bed, but

the success depends on the site and size of the primary tumour as well as technical factors. At present, there is no agreement on how the sentinel nodes should be examined and pathologists at centres not in a trial need to decide on a protocol. The use of frozen sections on bisected fresh nodes can compromise the detailed assessment of the paraffin-embedded tissue. Complete serial sectioning of the paraffin block is impracticable as a routine procedure and until the technique is fully evaluated, an acceptable compromise is step-serial sectioning at intervals of 150 μm with examination of HE-stained and AE1/AE3 immunostained sections.[21]

Potential pitfalls

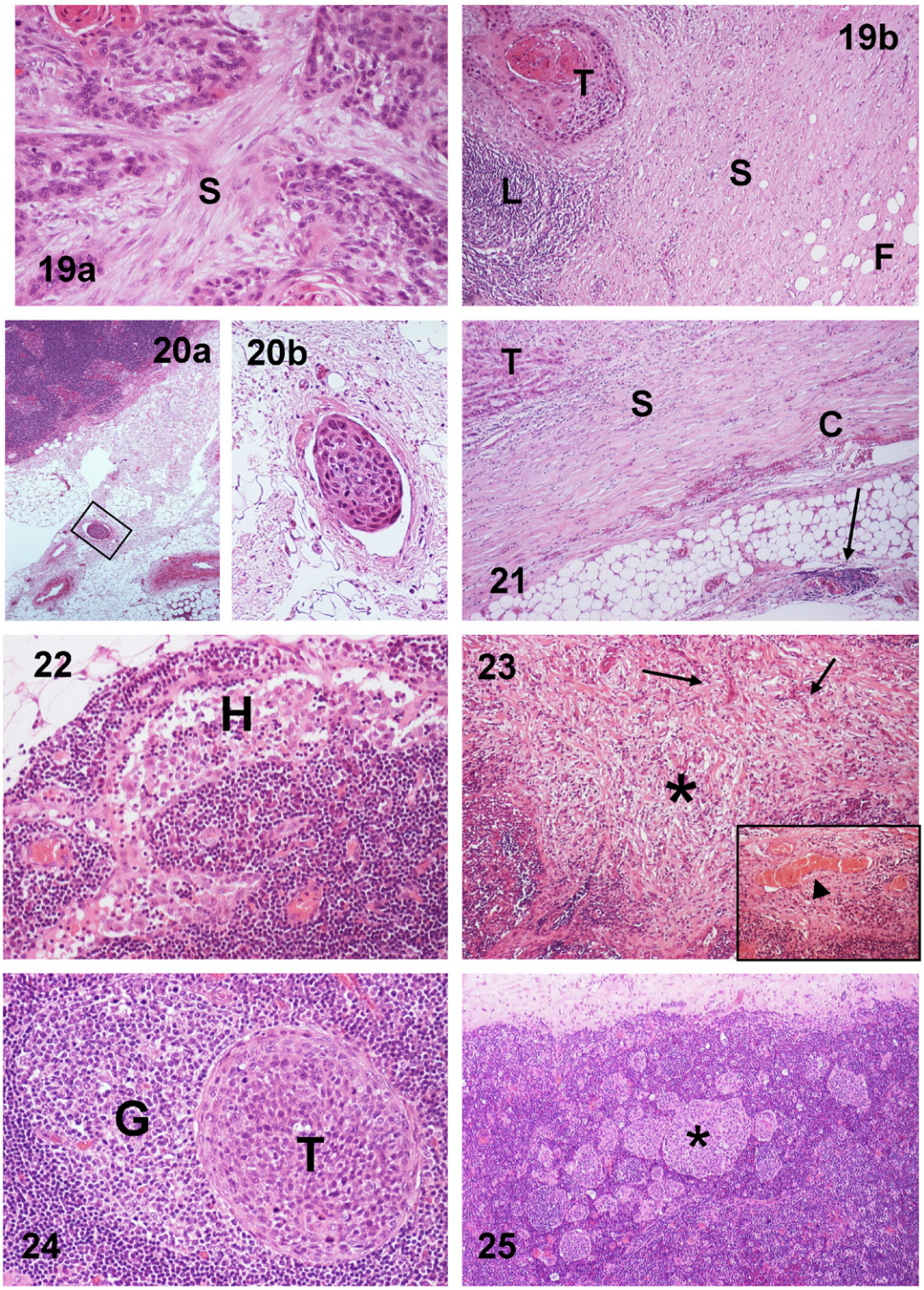
Several types of reactive changes within lymph nodes can cause confusion: sinus histiocytosis (Figure 22); vascular transformation of sinuses (Figure 23); changes in germinal centres (Figures 24 and 25); and hyaline change within lymphoid parenchyma (Plate 5, Figure 26). Granulomatous reaction in lymph nodes draining from primary tumours (Figure 27) is established and is usually of the sarcoidal/immunological type, in response to drained tumour products.[22] However, foreign-body granulomata in relation to small metastatic deposits and/or keratin deposition may occur (Figure 28). Also the possibility of concurrent granulomatous disease, e.g. tuberculosis, should be considered.

Several types of benign cellular inclusions may occur in or adjacent to cervical lymph nodes and care is necessary to differentiate these from micrometastases: salivary epithelium (Figure 29); thyroid epithelial inclusions (Figure 30), which are more likely in lymph nodes at anatomical levels III or IV than at level II; and naevus cell rests (Figure 31). IHC would be helpful in differentiating some lesions.

Very occasionally–around 1% of patients with metastasis[6]–show flushing of nodal sinuses at multiple anatomical levels with malignant epithelial cells and these could be misinterpreted as sinus histiocytosis (Figure 32). IHC is of help here. Though the possibility of transitory tumour passage cannot be excluded, these ''indifferent'' and ''atonic'' nodes[23] are regarded as positive.

Cystic metastases (Figures 9–11) and their differentiation from branchial cyst and primary branchial carcinoma are often discussed in the literature.[24,25] The age of the patient is important and it is recommended that the complete ''cyst'' is processed in a patient over 40 years and that step/serial sections are examined, since large areas of the cyst lining may have a benign appearance.

Plate 4 Figure 19. (a) Stromal reaction accompanies metastatic SCC in a cervical lymph node. In this instance, when compared with Figures. 15–17, fibroblasts are spindly, myxoid matrix is less conspicuous and fibrillary collagen is seen. These features suggest that the reaction is at a later stage of development and undergoes organisation. (b) Same specimen as Figure 19a. The picture shows part of the periphery of the node. From left to right, surviving lymphoid tissue (L), keratinising tumour (T), florid stromal reaction (S) that precedes the tumour and perinodal adipocytes (F) can be seen. The capsule and sinus have been obliterated. There is no demarcation between the stromal reaction and perinodal soft tissues, the adipocytes being intimately mixed with cellular and fibrous elements of the reaction. This qualifies as extracapsular spread. Figure 20. (a) Perinodal lymphatic embolism (area in rectangle). The cervical lymph node, part of which occupies the upper left corner of the picture, was free of metastatic tumour deposits. (b) Details of the embolus. Figure 21. As in the case illustrated in Figure 19b, florid late/organizing stromal reaction (S) precedes metastatic tumour deposits (T) at the periphery of a cervical lymph node, wherein obliterates the subcapsular sinus. In this instance, however, the stromal reaction merges with the nodal capsule (C), the latter being discernible by the laminated arrangement of its collagen fibres, and the contour of the nod appears preserved. Accordingly, there is no extracapsular spread. The arrow indicates perivascular chronic inflammation in the perinodal fat. Such inflammatory foci are occasionally seen at a distance ahead of the advancing front of intra-oral SCCs and interpreted as precocious stromal reaction far from the tumours. Figure 22. Sinus histiocytosis/catarrh (H) in a cervical lymph node. Abundant sinus macrophages are floating in the distended subcapsular sinus. They are non-coherent, palely stained and mixed with lymphocytes and lack mitotic activity. These features assist in distinguishing sinus histiocytosis from lymphatic embolism or permeation. Compare with Figure 12. Figure 23. Vascular transformation of subcapsular sinuses in a cervical lymph node. The sinuses are expanded by florid early fibrosis (asterisk) and newly formed thin-walled vessels (arrows). Elsewhere (inset), those vessels become congested (arrowhead). The transformation should not be confused with the neo-vascularisation evoked by a metastatic tumour deposit. Figure 24. A small metastatic deposit of non-keratinising SCC (T) is within a lymphoid follicle of a cervical lymph node. The germinal centre of the follicle (G) seems moulded to the deposit. Figure 25. Follicle lysis in a cervical lymph node. The original single germinal centre has been disrupted, and there are multiple small collections of germinal centre cells (asterisk), which may be confused with metastatic deposits of non-keratinising SCC. Immunohistochemistry for cytokeratins was negative.



In addition to conventional SCC, several subtypes are well described[26] and give rise to metastasis. Hybrid tumours (Figure 33) are also encountered and their metastases can cause confusion as the deposits may show one pattern only.

Report writing and presentation of findings

Various options exist: text and minimum data sets and diagrams.[9] An useful way of summarising the extent of nodal disease is the use of a grid (Plate 6,

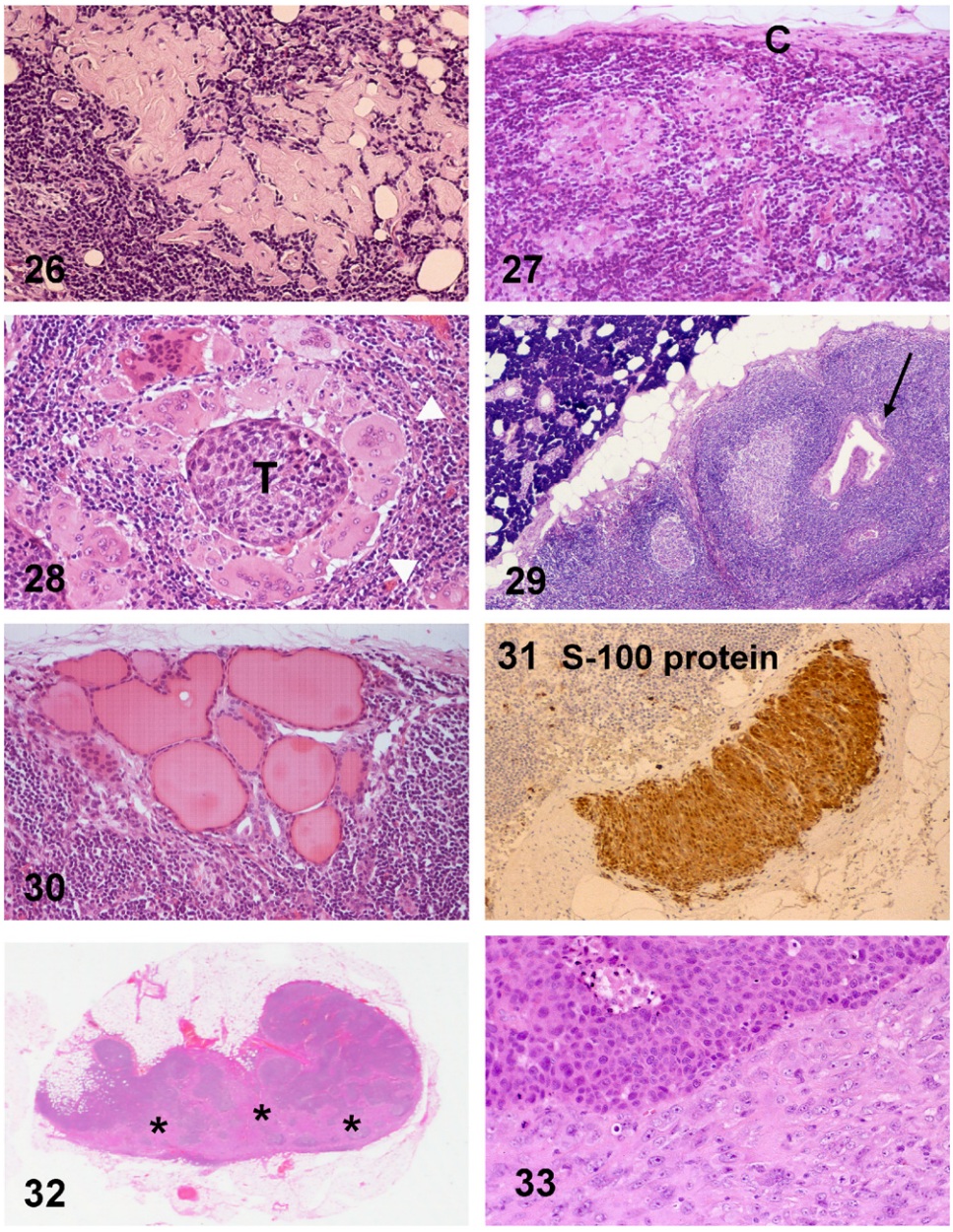


Plate 5 Figure 26. Hyalinisation of the fibrous framework in a cervical lymph node. The appearances are not attributable to amyloid or the scirrhous stroma of a metastatic tumour deposit. Figure 27. Epithelioid cell granulomas are seen in the cortex of a cervical lymph node below the capsule (C). Figure 28. A small metastatic deposit of non-keratinising SCC (T) in a cervical lymph node is surrounded by multinuclear histiocytes. This is an infrequent feature, foreign-body giant-cell reaction being usually associated with heavily keratinised deposits. Figure 29. A peri-parotid lymph node contains a benign microcystic epithelial inclusion (arrow). The inclusion features an irregular lumen lined by oncocytoid eosinophilic epithelium and simulates the appearance of a minute Warthin tumour. Part of the parotid occupies the upper left corner of the picture. Figure 30. Colloid-containing thyroid follicles are in the subcapsular region of a cervical lymph node. Papillary ingrowths are not seen and the follicles are lined by flattened bland epithelium. They should not be misinterpreted as metastasis of a primary thyroid carcinoma. Figure 31. A collection of naevus cells that express S-100 protein, is in the capsule of a cervical lymph node. Figure 32. In this cervical lymph node, the subcapsular sinuses and their extensions along the medullary cords, are distended with SCC (asterisks). Possibly, the node is ''bypassed'' before stromal reaction is established. Figure 33. A primary SCC of the head and neck shows different cellular phenotypes. Nodal metastatic deposits may express a single phenotype or both of them.

Level	Total	Tumour	ECS
IA			
IB			
IIA			
IIB			
III			
IV			
VA			
VB			
VI			

Total = total number of nodes examined; Tumour = total number of tumour involved nodes; ECS = presence of ECS; NI = not included in dissection

Plate 6 Figure 34. Grid for summary of lymph node data.

Figure 34). The pathological TNM stage should be clearly stated in the report.[4]

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