Cytodiagnosis and the necropsy

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Abstract
Aims—To assess the efficacy of cytodiagnosis in necropsy practice.
Methods—Fifty three focal lesions from 46 necropsies were assessed by direct smears taken from the lesions. The smears were air-dried and stained by a modified Giemsa technique, with two cases having supplementary histochemistry. All of the slides were assessed independently before review of the necropsy histology.
Results—Of the 35 malignant neoplasms, 34 were correctly identified as malignant and 14 of these were characterised precisely. Three of the four benign neoplasms were recognised as neoplastic. One was characterised precisely. Three of the four infected cases revealed the relevant microorganisms. Seven of the other 10 focal non-neoplastic lesions were correctly diagnosed as non-neoplastic. Only two cases proved unsatisfactory for cytodiagnosis.
Conclusions—Direct smear cytodiagnosis is quick, cheap and technically simple. Tissue autolysis may account for some difficulty in assessing particular tissues, but this should diminish with experience. Necropsy cytodiagnosis is applicable to all necropsies in all centres.

Clinical necropsy rates are in decline.1 2 One major criticism often cited by clinicians is the tardiness of necropsy report dissemination despite the existence of formal guidelines for report turnaround times.1 3 Rapid microscopic confirmation of the macroscopic findings would facilitate generation of necropsy reports and would find favour with pathologists, clinicians, general practitioners, the coroner, and relatives of the deceased.

In the context of the growing expertise and applications of cytology, we set out to evaluate the efficacy of direct smear cytodiagnosis in the necropsy.

Methods

Over four months, 46 necropsies were assessed by cytology, in which macroscopically distinct lesion/tumour was found and where ante-mortem investigations had either failed to provide a diagnosis or had failed to demonstrate the lesion. A total of 53 lesions were sampled by direct smears from these necropsies which were otherwise performed as standard.

In this technique the cut surface of the lesion was scraped by a glass slide, held so that the short edge of the slide was passed firmly across the lesion. The scraped material was transferred promptly, in small aliquots, on to other glass slides. These samples were then gently compressed by the flat surface of the first slide, spread and air-dried.4 5

Five smears were obtained from each lesion. These were fixed in alcohol and two were stained by a modified/rapid Giemsa method using “Rapidiff” (JCR Diagnostics BV, Doetinchem, The Netherlands). Stained slides were produced within two minutes, which were subsequently dried and covered with a coverslip. The processed slides were usually available for evaluation within 15 minutes. In two cases further histochemistry was performed (periodic acid Schiff (PAS); PAS/Wade Fite/Grocott) on the spare slides.

Keywords: Necropsy, cytodiagnosis.
All of the cases were assessed independently before the histology was reviewed and assigned the following categories: (1) malignant neoplasm with specific features permitting classification; malignant NOS (not otherwise specified); (2) benign neoplasm with specific features permitting classification; benign neoplasm NOS; (3) infection (requiring identification of the organism); (4) non-neoplastic focal lesions including inflammation, NOS, hamartomas, etc; and (5) unsatisfactory. The results of the cytological diagnoses were correlated with the subsequent formalin fixed, paraffin wax embedded necropsy histology (fig 1).

Results
Of the 35 malignancies, 34 (97%) were correctly diagnosed as malignant by cytology and in 14 (41%) there were sufficient morphological characteristics in the smear to permit a specific diagnosis. One case (carcinoma of the prostate) was misdiagnosed as non-neoplastic.

Three (75%) of the four benign neoplasms sampled were correctly diagnosed as neoplastic, with one showing characteristics permitting precise identification of the lesion. The other two cases could only be assigned to the neoplasm NOS category. The fourth case, being almost entirely infarcted, produced unsatisfactory smears.

Three (75%) of the four infected cases showed the microbial agent (Aspergillus spp in two, Candida spp in one) responsible for the lesion. In two cases this was visible by staining with Giemsa alone, and in another the PAS stain was needed to demonstrate the organism. The final case (invasive aspergillosis in an immunocompromised patient) was correctly identified as inflammatory but the fungus was not seen on staining with Giemsa, Grocott or PAS, indicating that this was "sampling false negative".

Ten focal/non-neoplastic lesions were assessed. In seven (70%) cases (pulmonary hamartoma in one, renal fibroma in one, nodular goitre in one, peptic ulcer in one, and focal pneumonia/pulmonary abscess in three) the cytological assessment was correct in evaluating these as non-neoplastic and non-infected cases. In six (86%) of these there were sufficient features to confirm the macroscopic interpretation. Two cases of acute prostatitis and one case of nodular goitre were incorrectly assessed as neoplastic, producing a false positive rate of 30% for this category.

Only two cases had unsatisfactory sampling: one was almost totally infarcted and yielded amorphous debris alone, and the other was correctly assessed as non-neoplastic despite not showing the infective agent. Thus, in this limited study the sensitivity of the technique could be considered to be 96%.

If accuracy is determined by correct assignment of lesions to the stated categories, then the overall accuracy was 89%.

Discussion
Cytodiagnosis is a well accredited technique with wide ranging applications. The necropsy has previously been used mainly to confirm antemortem cytological diagnoses; although primary necropsy cytodiagnostics methods/techniques (cerebrospiral fluid aspirates, imprints and bone marrow spread techniques) have also been described.

The direct smears from necropsy material provided an adequate cell yield and our pre-
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Figure 6. Groups of epithelioid cells within a mucoid/myxoid matrix, from a pleural lung tumour, classified as an epithelioid neoplasm—probably mesothelial although adenocarcinoma was not excluded. (Tubulo/epithelial malignant mesothelioma.)

Figure 7. Irregular fragments of metachromatic matrix with scanty groups of regular epithelial cells, from an asymptomatic lung nodule, classified as consistent with a pulmonary hamartoma. (Pulmonary hamartoma.)

Figure 8. A cellular and pleomorphic smear from a focal lesion in the prostate, classified as malignant. (Benign nodular hyperplasia and acute prostatitis.)

previous satisfaction with May/Grunwald/Giemsa stained cytology samples influenced the selection of the modified Giemsa (Rapidiff) technique. This method is quick and technically simple. The limited amount of equipment and stains may be permanently sited in the mortuary, for use when required.

The low cost of this test, resulting from the need for minimal personnel, small amounts of readily available and cheap materials without requiring specialist equipment, merits specific comment. The current financial climate may yet prove to be a further factor in reducing demand for necropsies, and thus any reduction in the cost of the necropsy is attractive.

The smears prepared were impressive in terms of cell yield and preservation of cellular morphology (figs 2–9). Tissue autolysis is not a problem and we speculate that early tissue autolysis may actually promote the separation of cells from each other and the surrounding connective tissue. The study also identified some limitations, with occasional samples which were unsatisfactory for analysis or may lack the architectural details that permit accurate histological diagnosis.

The potential health hazards of any necropsy technique must be considered. The provision of appropriate clothing/protective wear in the necropsy suite has been considered previously. The potential for “aerosol generation” is minimal if good quality smears are prepared which will dry promptly. All slides are fixed in alcohol in the necropsy room reducing the risk of transporting potentially infected material. Specific infection risks (hepatitis B/C, HIV, etc.) should be considered on an individual basis.

The technique is not advocated as a replacement for necropsy microbiology and histology, but by facilitating rapid and accurate diagnoses at the time of the necropsy, it may obviate the requirement for these. The technique also has clear attractions for those working in parts of the world where standard pathology laboratory facilities may not be readily available.

The wide range of lesions which could be evaluated by necropsy cytology could provide valuable experience for pathologists and MLSOs involved with the increasing range of diagnostic fine needle aspirates.

It is important to critically review the cases in which errors were made. The prostate was a particular problem site. Common features of cytological malignancy include a cellular background with anisocytosis and nuclear pleomorphism. The autolysing/inflamed prostate may show these features (fig 8) and, consequently, one must be extremely cautious when assessing lesions at this site. Difficulty was also experienced with one thyroid smear for similar reasons. We would expect that our initial difficulties with these tissues would reduce with increasing experience.

The study aimed to evaluate the potential for necropsy cytodiagnosis. We were greatly impressed by the quality and quantity of cytological material derived from this technique. The accuracy and sensitivity of cytodiagnosis would appear to confirm the value of this technique. Cytodiagnosis has much to offer necropsy practice in all centres. It is quick, inexpensive and involves little equipment or expertise in the process of slide production. The production of satisfactory smears permits prompt and accurate diagnosis in most cases involving focal lesions.
A cellular smear from a lung mass with malignant cells showing nuclear pleomorphism and abundant cytoplasm, classified as consistent with squamous carcinoma. (Squamous cell carcinoma.)


**Addendum**

A recent publication by Walker and Going (*J Clin Pathol* 1994;47:714-17) also supports a role for cytopathology in the postmortem room.