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Leading article

Fine needle biopsy: cytology, histology or both?

Percutaneous guided needle biopsy of mass lesions is a well established method for obtaining tissue for histological or cytological examination. In this month's issue a paper by Limberg *et al* illustrates the benefits of histological examination of tissue fragments of liver tumours obtained by 22 swg fine needle aspiration biopsy. Limberg *et al* show the value of this approach in obtaining a definitive diagnosis of hepatocellular carcinoma of the liver.

Cytology is a reliable method of diagnosing malignancy in most tissues.[1–3] False negatives occur, however, and the predictive value of a negative is too poor to be clinically useful. These failures may occur because of faulty guidance and sampling error due to small tumour size, inexperience, or a particularly deep and inaccessible site. A major cause of failure is inadequate sample, because of inappropriate, or too few cells being harvested. Vascular tumours, such as haemangiomas, produce bloody taps with few cells, some tumours incite a marked desmoplastic reaction and are very fibrotic, yielding dry aspirates. Necrotic tumours may yield debris or inflammatory cells only. Many carcinomas grow eccentrically with viable tumour cells in only part of the tumour mass.

There are several solutions to these problems. As individual experience increases, the more often the target is hit. Increasing the number of samples taken within the tumour and deliberately sampling widely from different areas within the mass improves the yield of malignant cells. Adequate intravenous sedation increases tolerance to painful deep abdominal biopsy, which enables more careful needle placement and allows more needle passes to be made. Better quality imaging and combined methods of imaging (computed tomography, ultrasound and fluoroscopy) give a more complete description of the tumour and its position and hence more accurate placement of the needle tip.[4]

Cytology on its own is inadequate in some patients, particularly with well differentiated tumours such as cholangiocarcinomas, hepatocellular carcinomas and many lymphomas. Immunocytohistochemistry or electron microscopy have the potential to help in this group of tumours, but have so far shown little benefit.[5,6] It is precisely in these circumstances that histological evaluation is necessary.

There are many advantages from large coherent samples: the specimen can be orientated in relation to the tumour mass and surrounding tissues, numerous sections can be taken from areas of interest and hence a number of different staining techniques can be used. Conversely, if a clearly defined tumour is not seen by preliminary imaging, cytology and fragment histology can be gained after numerous traverses through different parts of the target organ, and although the samples are small, the sampled space can be much larger.

For a histological diagnosis to be made, large tissue samples are needed. Specimens range from fragments of 4–5 mg total mass obtained by 22 swg fine needle aspirates, to 50 mg 14 swg specimens that can be obtained by a variety of needles (Menghini, Sure-cut, Tru-cut). The larger the sample, the more likely that a firm diagnosis can be made.

Limberg *et al* in this issue of *Gut* have assessed the value of histological examination of fragments from fine needle aspirates of liver tumours. They have shown that the sensitivity of this technique is equal to most cytological series and they have had particular success in characterising hepatocellular carcinomas. For several years we have been assessing the value of tissue fragments obtained by fine needle aspiration in a series of more than 300 pancreatic and biliary tumours. Using cytological techniques alone, sensitivities of only 77% in pancreatic and 60% in biliary cancers are the best that can be obtained.[4] We have found that fragment analysis did not improve the yield of malignancies diagnosed. Indeed, in many cases, histology had been negative when cytology was positive. Tissue fragment analysis may be selectively helpful in certain tumours, but not in all patients.

How large the tissue sample should be, remains unanswered. No single study comparing the diagnostic yield of different sizes of needles is available. The only indication of the comparative value of different needle sizes comes from comparing different studies where other factors affect the results. Obtaining a larger specimen requires the use of a larger needle and this increases the risk of bleeding, tumour seeding and damage to adjacent tissues. In a review of complications of fine needle puncture, Livraghi[7] has shown that the risk is very small with needles of <1 mm diameter, with a mortality rate of 1:20 000. Complications after large calibre needle biopsies are well documented,[8–12] with mortalities as high as 3% reported for operative 14 swg biopsy of the pancreas. It is difficult to assess the risk of using a larger needle in a given patient, but an attempt has to be made to balance the risk for that patient against the possible nature of the tumour being biopsied and the treatment options.

The greatest risk is always from bleeding, and the patient's clotting state must be fully known. Tumour vascularity can be assessed by enhanced dynamic computed tomography, or by angiography. Most of the reported deaths from conventional liver biopsy in patients with normal haemocoagulation have occurred from inadvertent biopsy of haemangiomas and other unsuspected vascular liver lesions. Biopsy can be avoided in many cases, because ultrasound and dynamic computed tomography used separately or together, can yield a very specific diagnosis of haemangiomas, liver metastases and many hepatocellular carcinomas.

A wide variety of needles is available to obtain histological samples varying from 14, 16, 18 to 20 gauge. One newly designed system is the 'Biopty TM' gun which uses a modified 18 or 14 gauge Tru-cut needle. We have been using this system extensively and have consistently obtained specimens of extremely good quality. This device is operated with only one hand, which is a great advantage in ultrasound or radiographically guided procedures. The needle is fired by a fast and powerful spring mechanism. This reduces the opportunity for needle deflection within the tumour and very precise and accurate positioning of the needle within the tumour mass can be obtained. Several patients having repeat liver biopsies have commented on how painless the biopsy was with this technique, compared

with manual biopsy. This may partly be caused by the speed with which the gun fires. Although localisation of the needle tip by ultrasound is more difficult than with some of the aspiration type needles, after the biopsy a clearly defined tract is seen within the tumour and very precise knowledge of the position of the sample is obtained.

When is histology appropriate?

As aspiration cytology has become more widely used, areas where a cytology fails are increasingly being recognised. In the liver, as discussed by Limberg *et al*, the diagnosis of hepatocellular carcinomas is problematic and if this diagnosis is being entertained, histology is necessary. Unfortunately these authors have not recorded the results of simultaneous cytological examination on their aspirates, therefore we do not know if the same, or additional malignancies are being identified by the two techniques. As more investigators combine the two techniques, the relative or summative value of performing both investigations should become clearer. We are at present evaluating the effectiveness of 18 gauge Tru-cut biopsies and comparing this with cytology in the diagnosis of pancreatic tumours. Initial analysis of the first 40 patients shows a higher sensitivity and specificity and a greater impact on management for 18 swg histology than for cytology.

Having decided to obtain histological material we suggest that a staged approach should be adopted. A 22 swg FNAB for cytology is initially done in all patients. If the aspirate is not bloody and there are no other contraindications, we then proceed to an 18 swg 'Biopty TM' biopsy. Suspected vascular lesions are previewed either by enhanced computed tomography or angiography. If the risks are considered to be more severe, the cytological results are awaited and if negative, we then plan a larger biopsy as a high risk procedure. Using this approach, the benefits of histology and cytology are maximised, whilst unnecessary risks are avoided.

A specific biopsy diagnosis is frequently the end point of our investigations and for 90% of adenocarcinomas this can be obtained safely and very easily by fine needle cytology. Fragment histology may help with other tumours, but in our hands has been disappointing. New biopsy techniques with 18 swg needles produce excellent histological material and carry an acceptable morbidity with mortality rates of the order of 1:5000.

Where FNA is negative or where there are important management decisions to be made, histology should be obtained and a properly planned and directed percutaneous approach will rarely fail.

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References

1 Lees WR, Hall-Craggs MA, Manhire AR. Five years' experience of fine needle aspiration biopsy: 454 consecutive cases. *Clin Radiol* 1985; **36:** 517–20.
2 Harter LP, Moss AA, Goldberg HI, Gross BH. CT-guided fine needle aspirations for diagnosis of benign and malignant disease. *AJR* 1983; **140:** 363–7.

3 Ferrucci JT, Wittenberg J, Mueller PR *et al.* Diagnosis of abdominal malignancy by radiologic fine needle aspiration biopsy. *AJR* 1980; **134:** 323–30.
4 Hall-Craggs MA, Lees WR. Fine needle aspiration biopsy: pancreatic and biliary tumours. *AJR* 1986; **147:** 399–403.
5 Yam LT, Winkler CF. Immunocytochemical diagnosis of oat-cell carcinoma in pleural effusion. *Acta Cytol* 1984; **28:** 425–9.
6 Droese M, Altmannsberger M, Kehl A *et al.* Ultrasound-guided percutaneous fine needle aspiration biopsy of abdominal and retroperitoneal masses. Accuracy of cytology in the diagnosis of malignancy, cytologic tumour typing and use of antibodies to intermediate filaments in selected cases. *Acta Cytol* 1984; **28:** 368–84.
7 Livraghi T, Damascelli B, Lombardi C, Spagridi I. Risk in fine needle aspiration biopsy. *J Clin Ultrasound* 1983; **11:** 77–80.
8 Lightwood R, Reber H, Way L. The risk and accuracy of pancreatic biopsy. *Am J Surg* 1976; **132:** 189–91.
9 Backman U, Lindgren PG. Percutaneous renal biopsy with real-time ultrasonography. *Scand J Urol Nephrol* 1982; **16:** 65–6.
10 Wolinsky H, Lischner MW. Needle tract implantation of tumour after percutaneous lung biopsy. *Ann Intern Med* 1969; **71:** 359–62.
11 Desai SG, Woodruff LM. Carcinoma of prostate. Local extension following perineal needle biopsy. *Urology* 1974; **3:** 87–8.
12 Haubek A, Hansen HE. Ultrasonically guided renal biopsy. In: Holm HH, Kristensen JK, eds. *Interventional ultrasound.* Copenhagen: Munksgaard, 1985: 84.