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NEEDLE BIOPSY

A CLINICAL TEST

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INTRODUCTION

Needle biopsy in one form or another is not new, having been in use from time to time for nearly a century.

Even at present its use is surprisingly sporadic and limited, yet those who have given it a fair trial have become converts. In a country such as South Africa where pathological and microscopic examinations are centralized and where the population is spread over vast areas, biopsy in one or other form is the ideal method of diagnosis in cases of doubt. It is not always possible to proceed with definite treatment in distant places. Therefore, it is more practical to make a specific diagnosis and then refer the patient to the appropriate clinic. This is where needle biopsy is imperative.

Needle biopsies[1] may be divided into:

(*a*) *Aspiration type,* using wide-bore needles (Franseen type). Here, either a core or bits of tissue are taken. These biopsies are on the whole unsuccessful, because of the percentage of false histopathological diagnoses.

(*b*) *Non-aspiration type* — with direct removal of a core of tissue. Several needles have been invented, namely, the Vim-Silverman or its Franklin modification, the Zurkel biopsy needle, and the Hutchins biopsy needle.

The Vim-Silverman needle has been used exclusively in this series and has been found to be completely satisfactory.

It is not sufficient for a surgeon[2] to do a needle biopsy indiscriminately, for he has a responsibility to the pathologist in determining success or failure of the biopsy. Unless care is taken to take a 'representative' sample a negative or doubtful report will result.

INDICATIONS

The basis of medicine is diagnosis of the patient's condition and this is where needle biopsy is invaluable,[4] not only as a diagnostic aid, but also as a method of assessing prognosis. So true is this that in our experience it is one of the clinical tests to be applied to 'lumps' and 'bumps' of doubtful diagnosis anywhere in the body.

This procedure is easy, simple, safe and, in the vast majority of cases, accurate. It can therefore be used in the following situations:

1. In lumps of doubtful diagnosis, diagnosis can be made without hospitalization and without interfering with the eventual treatment. This allows for planned operations — such as combined surgical and radiotherapeutic treatment.

2. Palpable masses covered by normal tissue can be biopsied with virtually no interference of the normal tissue.

3. During operations, masses involving anatomical structures which it would be dangerous to touch (e.g. a mass in the pancreas in certain instances) can be biopsied.

4. Masses (e.g. sarcomas) which tend to break down if even a simple incision is made into them, can now be diagnosed without this complication.

5. Masses which can be diagnosed only on biopsy, e.g. certain lesions of the bone marrow, liver, spleen, kidney, pleura, etc.

6. Biopsies of swellings of secreting glands, e.g. the parotid, can be performed without permanent fistula formation.

7. The extent of tumour involvement may be defined by needle biopsies at different levels.[3]

BIOPSY METHODS

Equipment

The needle used is the Vim-Silverman needle consisting of 3 sections:

(*a*) A hollow needle of wide bore and varying lengths.

(*b*) A stilette to fit the needle.

(*c*) A biopsy needle $\frac{1}{4}$ of an inch longer than the above-mentioned needle.

A tray should be set containing:

1. A Vim-Silverman needle.
2. Bowls containing swabs, spirits, 'cetavlon' and 'hibitane'.
3. Two syringes, one large (20 ml.) and one small (2 - 5 ml.), with injection needles of varying sizes.
4. A small-bladed scalpel or tenotome.
5. Local anaesthetic (1% lignocaine or its equivalent).
6. Collodion.
7. Bandages and strapping.

Technique

The area over the mass is cleaned and, if very hairy, shaved. A point is selected on the skin nearest the lump, avoiding any important anatomical structures.

Using the small syringe with local anaesthetic, a wheal is raised and a track extending from the skin to the mass is anaesthetized.

A nick, $\frac{1}{8}$ of an inch long, is made in the skin and through this the needle with its stilette is inserted, being allowed to enter the mass to a sufficient depth to fix it. The stilette is withdrawn, the large syringe is attached and suction is applied. If there is aspirate, the cavity is emptied first; if there is no aspirate the procedure is continued.

The Vim-Silverman needle is introduced to its full extent, i.e. $\frac{1}{4}$ of an inch beyond the hollow needle. The hollow needle is then pushed in further to oppose and cover the jaws of the Vim's needle. Both needles are then rotated together through 90° and withdrawn. The hollow needle is removed. The specimen lies between the jaws of the Vim's needle. It is removed with a sharp needle and placed in 10% formol-saline.

The entry wound is sealed with collodion or acrylic-acid spray.

While no special premedication is required, in children up to 14 years of age we use rectal suppositories of thiopentone sodium, inserted half an hour before the biopsy. The dosage is calculated as 15 mg. per lb. body weight. The rest of the procedure is as described above.

Difficulties

There are no serious difficulties, but certain problems do arise:

1. The specimens are small, and distortion by rough handling and improper fixation should be avoided. This distortion is best guarded against by the use of a sharp-pointed needle as described under 'technique'.

2. The biggest single difficulty is the size of the mass, for masses smaller than half an inch in diameter make it impossible to assess if the mass or surrounding tissues have been biopsied. We therefore recommend other forms of biopsy in lumps with a diameter of less than half an inch.

3. Another experience, rather than difficulty, arises in the biopsy of very vascular structures; this may include the inadvertent piercing of a vessel and the biopsy of a fast-growing sarcoma. In both instances blood pours out of the needle. The needle should then be shifted to make certain that a vessel has not been entered, for the flow of blood *per se* should not interfere with the biopsy. At the end of the biopsy a pressure dressing is applied and left for ½ - 1 hour. In bleeding diathesis, needle biopsies should be avoided.

4. Infections along the tract may occur if an adequate aseptic technique is not used.

No other difficulties have been encountered. There have been no complications in any of the range of biopsies done so far.

PRESENT USES[1,2,5,6,8-10]

Liver and kidney biopsies were excluded from this series since they have so often been discussed. The range of biopsies has been unlimited and this series includes 100 consecutive needle biopsies in 96 patients, made up as follows:

Masses in the breast	34
Masses in the cheek	12
Thyroid enlargements	9
Masses in the neck	9
Masses in the leg and groin	9
Lung (excluding pleura)	6
Masses in the arm	4
Parotid enlargements	4
Chest wall	3
Pleura	3
Abdominal masses	3
Palatal masses	2
Mandibular mass	1
Mass on forehead	1

Details of the various sites are as follows:

1. *Breast*

In a total of 34 breast masses there were, on analysis, 19 (56%) carcinomas of different grades; 8 (24%) fibro-adenomas, either intra- or extra-cannalicular; 4 (12%) examples of generalized fibroadenosis having an accented nodule; and 3 (8%) inflammatory masses. Not only were we able to prove these diagnoses on further conservative or surgical therapy, but in groups of carcinomas and fibro-adenomas, the actual types were distinguished. One example may be cited: An African woman aged 68 complained of having a lump in the breast for a year. A wedge biopsy was done, but proved to be non-specific. The clinical features, however, were those of a late carcinoma of the breast. She was sent to the General Hospital Radiotherapy Unit where, before treatment could be started, a definite diagnosis was needed. A needle biopsy was done showing an adenocarcinoma; thus the treatment could be continued.

This example shows the need for carefully selecting the area of biopsy. In this instance the breast mass was surrounded by inflammatory reaction and the depth to which a needle could go revealed pathology which was missed by a more superficial wedge biopsy.

It is clear, therefore, that needle biopsy of the breast is a valuable test. In our series we had a success rate of 100% with no complications. In other, much larger, series errors do creep in, leaving a final correct biopsy rate of about 98% — a highly satisfactory result.

It can be said that needle biopsy in breast lumps, provided they are larger than half an inch in diameter, is directly indicated.

2. *Masses in the Cheek, Neck and Salivary Glands*

A total of 25 biopsies was done in these areas with correct diagnosis in 23, i.e. 92% success. It is felt that with more experience a better percentage will be achieved. It is noteworthy that only 1 of the parotid biopsies produced a fistula, which cleared up within 10 days. Needle biopsy does play a definite role in undiagnosed masses in this region.

Case 1. A.M., aged 40, an African male, was admitted to hospital with a history of an enlarged mass in the left anterior triangle of the neck of 3 months' duration. Clinically he had a matted mass of lymph nodes in the left anterior triangle of the neck and a left 12th nerve lesion. It was suggested that this mass was malignant because of its fixation. On needle biopsy, done without any difficulty, a pathological report disclosed a de-differentiated squamous carcinoma. Further examinations of the mouth, pharynx, larynx and oesophagus failed to reveal a primary focus. Radiation therapy was instituted.

Comment. This was a patient in whom surgery was avoided and radiotherapeutic treatment could be instituted without masking by surgery.

Case 2. L.M., aged 26, an African female, was seen with a lump in the left cheek, of 6 years' duration. On examination, a firm mass in the cheek, 1 inch in diameter, was found attached deeply, but not to skin. Investigations included sialography, which showed a mass displacing the parotid duct, but not interfering with the rest of the duct system. Clinical diagnosis was uncertain. On needle biopsy a mixed salivary tumour was diagnosed. This was removed and the diagnosis was confirmed.

Comment. Because a diagnosis was available at the time of operation, it was possible for radiotherapists to be present to deal with any portion of the tumour which could not be removed.

Case 3. J.M., aged 46, an African male, had a proved carcinoma of the right antrum. A week after admission he developed a lump in his right cheek, free from bone attachment, but attached to skin, which caused him considerable pain. Was this neoplastic or inflammatory? A needle biopsy showed this to be a squamous carcinoma. Excision was pointless, and a satisfactory result was obtained by X-ray therapy.

Comment. A diagnosis was obtained with minimum trauma.

Case 4. Jerry M., aged 67, an African male, was admitted to hospital with a mass in his right parotid, of 4 years' duration. Sialography showed some cutting off of the ducts. Needle biopsy confirmed the impression that this was a malignant growth. Combined surgical and radiotherapeutic treatment was instituted.

Comment. The definite diagnosis of malignancy made it possible for the surgeon to deal with the facial nerve in

a freer way than if there was a chance that it was a non-malignant tumour. There was no parotid fistula.

Case 5. B.M., aged 47, an African female, was seen with non-specific lymph nodes in the neck, and with an ill-defined chest pathology. Rather than interfere surgically, a needle biopsy was done. This showed tuberculosis in a lymph node. Anti-tuberculous treatment was begun and the lesions vanished.

Comment. An unnecessary operation was avoided.

3. *Thyroid Gland*[1]

The use of needle biopsy in this site is a moot point. Of 9 biopsies, only 5 gave the correct diagnosis. These poor results may be due to the following:

(*a*) The thyroid-gland mobility may make it difficult to get a representative sample.

(*b*) There may be haemorrhage into the gland.

(*c*) Histological difficulties may occur in diagnosis between follicular adenoma, follicular carcinoma, and nodular adenomatous goitre.

(*d*) Possible cancer coexisting with thyroiditis may not be uncovered.

This, therefore, is one site where surgical exposure is recommended in uncertain diagnosis.

Case 6. M.R., aged 74, a European male, presented with a mass in the right lobe of the thyroid, of 14 years' duration; this had enlarged. Clinically it was recently diagnosed as an adenoma. Iodine-uptake studies and scintillography confirmed this diagnosis. The patient was advised to have surgery, but refused. It was thought that a definite diagnosis was obligatory since malignancy was not ruled out. Needle biopsy revealed a very large cyst, the wall of which showed compressed thyroid tissue; probably a non-specific thyroid cyst. A sclerotic agent (sodium psyliate)[7] was injected and this led to the disappearance of the mass.

Comment. Despite clinical and laboratory evidence, needle biopsy not only gave a proper diagnosis, but also paved the way for a cure in an elderly, ill patient, without hospitalization.

Case 7. A.M., aged 60, an African female, was seen with a mass in the thyroid of 3 months' duration. Clinical and laboratory tests showed a malignant thyroid. A needle biopsy was done, and this showed only a follicular adenoma. Surgery was undertaken, and the mass proved to be a follicular carcinoma.

Comment. Case 7 demonstrates the unreliability of needle biopsy in masses of the thyroid.

4. *Masses in the Legs and Arms*

These totalled 13 and included lymph-node masses in the groin and axilla. Of this number, 11 gave the correct final interpretation. This group, too, included masses which proved to be sarcomas. It is noteworthy that, although the diagnosis of sarcoma was given histopathologically, the exact typing, i.e. whether lipo- or rhabdo-myosarcoma, etc., was not defined. This, however, is of very little significance clinically.

The advantages were that there was no breakdown of the biopsy site, which almost always occurs in wedge or formal biopsies. Thus, definite treatment could be instituted from the start. If these tumours are suspected, I make a plea for the patients either to be sent untouched to a hospital with surgical and radiotherapeutic facilities or, at most, to have a needle biopsy first and be sent in with the result. Too many patients whom treatment could have benefited have had their chances minimized by more formal surgery or even small wedge biopsies.

Case 8. A.M., aged 41, an African male, developed a lump in the left axilla over 1 week. When first seen, a diagnosis was made of an axillary abscess, which was settling. The acute inflammation resolved, but the mass remained. A needle biopsy was done which showed a fungal condition. Antifungal treatment was instituted with great diminution of the mass, which, instead of being diffuse, was now displayed as several small discrete masses. Since no further resolution ensued excision was decided on. This showed a Hodgkin's reticulosis.

Comment. Here was a patient with a fungal condition hiding a reticulosis. Needle biopsy allowed treatment to be instituted and changed a difficult operation into a simple one.

Case 9. T.C., aged 30, an African male, was seen with a painless lump on the left thigh of 6 months' duration. Clinically this appeared to be a sarcoma. Since proof was needed before any therapy was begun, a needle biopsy was done. This showed a sarcoma of neurogenic origin. No fungation of the mass ensued. The mass was excised with the regional lymph nodes. The final diagnosis was sarcoma of neurogenic origin.

Comment. A diagnosis of a sarcomatous mass was arrived at, without fungation or spread of the neoplasm.

Case 10. E.L., aged 13, an African female, was seen with a tumour about the right knee of several months' duration. Clinically and on X-ray it suggested a sarcoma of either bone or muscle. The report of the needle biopsy read: 'Sarcoma — unable to type on section submitted'. This was enough proof to proceed with a more formal excision. The final diagnosis was osteogenic sarcoma.

Comment. Here is an example which is not infrequent in masses proving to be sarcomas; the diagnosis of sarcoma is made, but the exact type cannot be defined.

5. *Lung, Pleura, Liver and Kidney*[1,2,5]

There were 12 cases in this group. Much has been written concerning these biopsies. Perhaps some comment may be made about the lung biopsies, of which there were 6 in this series. The only masses which could be biopsied successfully were those in which the pleura was fixed over them, otherwise the lung would slip away and pleural biopsy would result.

Two cases may be cited where the patients presented with large lung masses, in which thoracotomies would have been dangerous. Both cases were diagnosed as carcinoma on needle biopsy, and appropriate therapy could be instituted immediately. There was no discomfort to either of the patients, since the procedure was carried out in their beds in the ward.

Apart from recommending needle biopsy in various undiagnosed conditions of these organs, there is little to add to the remarks made in the references quoted.

6. *Miscellaneous*[3]

This group numbered 7, and was made up of 2 palatal masses, 1 mandibular mass, 1 mass in the forehead, and 3 masses on the abdominal wall. All these were correctly biopsied by the needle method.

Case 11. D.Z., aged 65, an African female, after having teeth removed 4 months ago, noticed a swelling on the palate (right side) which clinically suggested a malignant epulis. A needle biopsy showed a basal-cell carcinoma, which was confirmed on formal excision.

Comment. A diagnosis was made in a lump of doubtful diagnosis.

Case 12. E.C., aged 42, an African male, had a mass in the left mandibular angle — clinically it was diagnosed as inflammatory tuberculosis. A needle biopsy confirmed this. Treatment resulted in cure.

Comment. An operation was avoided.

Case 13. S.S., aged 50, an African female, was treated for a sarcoma of the left thigh. She developed a superficial abdominal mass, and needle biopsy showed a metastatic nodule.

Case 14. S.M., aged 75, an African male, was admitted with lumps in the right cheek and left forehead. Clinical diagnoses of the lump on the forehead included simple fibroma, lipoma, neurofibroma, granuloma, and sarcoma. Needle biopsy showed fibroblasts and subacute inflammation. The lump was excised and no further trouble ensued.

Comment. An obscure diagnosis was clarified.

ADVANTAGES OF NEEDLE BIOPSY

1. Needle biopsies can be performed in the doctor's consulting room.

2. In more than one instance this method has proved more reliable than a wedge-type biopsy.

3. It may be safely carried out where incision would be dangerous.

4. It may be undesirable to incise a tumour because of possible increased rate of spread or implantation. This has not been seen in this series over 2 years using needle-biopsy methods, although theoretically it is possible.

SUMMARY

Taking into consideration the experience gained by the above-mentioned biopsies, several conclusions may be arrived at. They are as follows:

1. Needle biopsy using a Vim-Silverman needle is simple, safe and reliable.

2. A diagnosis can be made without interfering with any future treatment.

3. Over a period of 2 years no spread along the track of the needle or elsewhere by neoplastic processes has been observed, following needle biopsy.

4. While being extremely useful, even necessary in most sites in the body, its use in masses in the thyroid and enlarged lymph nodes should be replaced by formal biopsies (excision if possible).

5. Needle biopsy, therefore, is another step towards the ultimate elucidation of the secrets of human pathology in the living.

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