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# Percutaneous fine needle biopsy in pediatrics

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**Abstract.** We performed 25 percutaneous fine needle biopsies (PFNB) on pediatric patients during a 3-year period. Of 17 patients with proven malignancies, PFNB was true positive in 16 and false negative in one. In nine patients with benign or inflammatory disorders, there were three true positives and six false negatives. There were no complications either from PFNB or larger caliber core biopsies, which were also performed in selected cases. All procedures were performed with ultrasound and/or fluoroscopic guidance. General anesthesia was not required, except in cases where PFNB was performed together with a surgical procedure. PFNB is as accurate and safe in pediatric patients as in adults. It should be considered prior to any open surgical procedure performed for biopsy alone.

Percutaneous fine needle biopsy (PFNB) has received increasing acceptance in recent years with the appreciation of its accuracy, safety and cost effectiveness [2]. Despite recent reports of its application in infants and children [1, 4, 6] we have noted concern among clinicians that lack of patient cooperation and the attendant need for sedation or anesthesia may increase the risk of this procedure in the pediatric age group.

We have reviewed our experience with PFNB and have found it to be safe and highly accurate in the diagnosis of malignant disorders with a more limited but still important role in benign neoplastic and inflammatory disease.

## Materials and methods

We reviewed all PFNB (20 to 22 gauge needles) performed or supervised by one of the two radiologist coauthors from January of 1981 through September of 1984. We excluded postoperative and inflammatory fluid collections where specimens were sent for microbiologic and chemical studies only.

All of the procedures were performed using imaging guidance. Fluoroscopy was used for the chest and paraspinal regions. For superficial lesions, a preliminary ultrasound was done to estimate the depth and to avoid any areas of necrosis. Deeper abdominal and pelvic masses were biopsied with real-time ultrasound guidance. The transducer was placed in a sterile glove at a point separate from the puncture site and the needle was kept in the sonographic field of view. When performing biopsies with real-time ultrasound, we found it easier to image 20 gauge needles. Although many of the patients underwent preliminary computed body tomography (CT), we did not use it during any of the biopsies.

All of the patients were given local anesthesia - lidocaine 1%. No sedation was needed for superficial masses in cooperative patients. Parenteral sedation, either Demerol/Phenergan/Thorazine (2.5/0.5/0.5 mg/kg ratio) as a single intramuscular dose or Demerol 1 mg/kg and Valium 0.2 mg/kg given by slow intravenous injection [3, 7] was used in younger patients or for those with deeper lesions. Three patients underwent biopsy under general anesthesia incident to some other procedure such as surgical placement of a central venous line. All patients receiving parenteral sedation were placed on a cardiac monitor and observed by a nurse or second radiologist. Soft restraints or sandbags were placed on the extremities. Standard fine needle aspiration technique was used [5]. Usually two to four separate passes were performed during a single procedure. The needles were given to the cytopathologist in attendance who expressed and smeared the material onto glass slides. In most cases, both air dried and smears fixed immediately in 95% Ethanol were prepared. The fixed smears were stained by the Papanicolaou technique; the air dried smears were stained with 0.25% toluidine blue. Small tissue fragments obtained by needle aspiration were fixed in Bouin's solution and embedded for routine histologic sectioning. The pathologist examined the air dried specimens and gave a preliminary report on their adequacy and sometimes the diagnosis before the patient left the department. If the preliminary report indicated an inadequate specimen or was not diagnostic, additional fine needle biopsies and, in some cases, core biopsies with 19 to 21 gauge Menghini type needles or 14 gauge Trucut needles were obtained.

## Results

In 17 patients with proven malignancies (Table 1) PFNB was classified as true positive in 16 and false negative in one - a hepatic Hodgkins recurrence where both PFNB and core biopsy showed only fibrotic tissue and hemorrhage. The diagnosis was made by surgical wedge biopsy.

**Table 1.** Malignant neoplasms

| Case | Age | Sex | Clinical history | PFNB | Final diagnosis |
|---|---|---|---|---|---|
| 1 | 7 | M | Acute lymphocytic leukemia, suboccipital mass | Leukemia | Same |
| 2 | 3 | M | Neuroblastoma, back mass | Neuroblastoma | Same |
| 3 | 5 | F | Acute lymphocytic leukemia, pelvic mass | Leukemia | Same |
| 4 | 5 | M | Liver mass | Hepatic sarcoma | Same |
| 5 | 2 | M | Liver mass | Hepatoblastoma | Same |
| 6 | 2 | F | Hepatoblastoma Mediastinal mass | Metastatic hepatoblastoma | Same |
| 7 | 17 | M | Superficial flank mass | Rhabdomyosarcoma | Same |
| 8 | 7 | M | Inguinal mass | Non-Hodgkins lymphoma | Same |
| 9 | 6 | M | Wilms' tumor back mass | Metastatic Wilms' | Same |
| 10 | 14 | M | Retroperitoneal mass | Non-Hodgkins lymphoma | Same |
| 11 | 8 | M | Pelvic mass | Non-Hodgkins lymphoma | Same |
| 12 | 2 | M | Wilms' tumor, Pulmonary nodule | Metastatic Wilms' | Same |
| 13 | 17 | F | Liver mass | Hepatoma | Same |
| 14 | 4 | M | Calf mass | Rhabdomyosarcoma | Same |
| 15 | 9 | M | Retroperitoneal mass | Rhabdomyosarcoma | Same |
| 16 | 6 | M | Brain stem tumor, enlarged nerve roots on myelography | Astrocytoma | Same |
| 17 | 16 | M | Hodgkin's disease, liver mass | Fibrous tissue | Hodgkin's disease |

There were nine biopsies of benign and inflammatory lesions (Table 2). Three were true positive and six considered to be false negative either because of insufficient quantity (three cases) or because subsequent surgical biopsies were performed yielding additional diagnostic information that affected patient management.

In no case was the diagnosis made from core biopsy alone when the PFNB was negative. There were no immediate or delayed complications.

**Table 2.** Benign and inflammatory disorders

| Case | Age | Sex | Clinical history | PFNB | Final diagnosis |
|---|---|---|---|---|---|
| 1 | 16 | M | Sickle cell disease, liver masses | Abscess | Same |
| 2 | 8 | M | Neurofibromatosis Retroperitoneal mass | Neurofibroma | Same |
| 3 | 15 | M | Back pain, narrowed thoracic disk | Diskitis | Same |
| 4 | 12 | M | Chest pain, pleural mass | Inflammatory cells | Subpleural abscess, surgical excision |
| 5 | 4 | M | Seizures, pulmonary nodule | Inflammatory cells | Cysticercosis, surgical excision |
| 6 | 8 | M | Non-Hodgkin's lymphoma, renal mass | Normal kidney | Simple cyst, surgical excision |
| 7 | 2 | F | Fever, lytic rib destruction | Insufficient | Osteomyelitis, open biopsy |
| 8 | 9 | M | Neurofibromatosis, scrotal mass | Insufficient | Neurofibroma, open biopsy |
| 9 | 6 | M | Lymphoma, possible abnormal node on lymphangiogram | Insufficient | No change in size without therapy |

## Discussion

In the major indication for PFNB in our series was suspected metastatic disease or diagnosis of primary malignancies where radiation or chemotherapy was planned prior to surgical resection. We have found PFNB to be very accurate and safe in this context with only one false negative diagnosis. In our experience PFNB and core biopsy have been less successful in the diagnosis of inflammatory and benign lesions. There are several possible factors for this including lack of typical cytopathologic findings in benign tumors, empiric prior antibiotic treatment of many inflammatory masses and sampling error. Nevertheless, since there has been no significant morbidity from the procedures and negative results are available within several hours, we do not feel that failure to make a diagnosis by PFNB compromises care of the patient or significantly delays appropriate treatment. In several cases, positive results have allowed cancellation of planned laparotomies or thoracotomies. Some of the PFNB have been done on an outpatient basis yielding a considerable cost savings.

On the other hand, we do not advocate PFNB for potentially resectable neoplasms since neither positive or negative results will alter the need for surgical excision.

We feel that our preference for fluoroscopic and realtime sonographic guidance has several advantages. These include performing the biopsy in the special procedures room which is better equipped, more spacious and more readily available than the CT suite. In addition, it is easier to adjust for sudden patient movements, which might necessitate repositioning and rescanning with CT. Nevertheless, this is primarily a matter of physician preference and with experience successful biopsies can be performed using any appropriate type of imaging guidance.

We feel that the most important factor in successful performance of the biopsy is careful attention to patient preparation and sedation, which in our experience has always been successfully accomplished by using parenteral medication, and close collaboration between the clinician, radiologist and pathologist.

## Conclusion

Percutaneous fine needle biopsy can be performed in infants and children without the need for anesthesia or hospitalization. It appears to be as safe, accurate and cost effective in infants and children as it is in adults. In the appropriate clinical circumstances, it deserves greater consideration as an alternative to open surgical biopsy.

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(continued on p. 419)