Fine Needle Aspiration Cytology: A Useful Diagnostic Tool in Childhood Tumors

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ABSTRACT

Objective — *To find out the diagnostic role and utility of fine needle aspiration cytology (FNAC) in pediatric tumors /swellings.*

Study design — *Descriptive case series.*

Place & Duration of study — *Department of Pathology National Institute of Child Health Karachi, from January 2005 to December 2011.*

Methodology — *Children up to 13 year of age were included in this study. The procedure was explained and consent taken. Material from the tumor / swelling was aspirated with a 10ml syringe having 20G needle for superficial tumors while 22G needle with trocar was used for deeper tumors. Slides were made, air dried, fixed and stained with Leishman and Papanicolaou stains. Clot taken was preserved in 10% formaline and processed for histology.*

Results — *A total of 1337 FNAC procedures were performed. There were 1067 (79.8%) benign and 270 (20.2%) malignant cases. Further breakup of benign cases revealed tuberculosis in 279 (26.1%), chronic inflammation / cold abscess in 421(39.5%), post BCG lymphadenitis in 52 (4.9%), reactive lymphadenitis in 130 (12.2%), acute inflammation in 44 (4.1%), lipoma in 30 (2.8%), hematoma in 34 (3.2%), lymphangioma in 31 (2.9%), thyroid cyst in 08 (0.75%), gynecomastia in 03 (0.28%) and benign inconclusive tumors in 35 (3.3%) cases.*

The malignant cases diagnosed by FNAC were Hodgkins disease (n=64 - 23.7%), Non-Hodgkins Non-Burkitts lymphoma (NHNBL) (n=60 - 22.2%), Burkitts lymphoma (n=09 - 3.3%), malignant histiocytosis 41 (15.2%), round blue cell tumour of childhood 13 (4.8%), neuroblastoma (n=17 - 6.3%), rhabdomyosarcoma 12 (4.4%), nephroblastoma 10 (3.7%), retinoblastoma (n=9 - 3.3%), metastatic nasopharyngeal carcinoma (n=3 -1.1%), and malignant teratoma (n=2 - 0.7%). Thirty (11.1%) malignant lesions remained inconclusive as to exact pathology.

Conclusions — *FNAC is an important diagnostic tool with high yield. It can be used with confidence in making diagnosis specially differentiating benign from malignant conditions.*

Key words — *FNAC, Tumors, Children.*

INTRODUCTION:

Fine needle aspiration cytology began to flourish in the 1950s and 1960s in Europe.[1-3] The method is applicable to tumors that are easily palpable. Modern imaging techniques, like ultrasonography computed tomography and magnetic resonance imaging help in taking samples from organs and tumors that are not easily accessible.[4]

The clinical value of FNAC is not only limited to neoplastic conditions, it is also valuable in the diagnosis of inflammatory, infectious and degenerative lesions.[5] Supervision of sampling and specimen handling by a competent pathologist is crucial for achieving a high diagnostic accuracy.

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Before attempting a diagnosis by FNAC, the pathologist must have full knowledge of the clinical history, physical examination and the results of other laboratory tests. Clinical data serve as a safeguard in the interpretation of the aspirate however it should not produce bias. Any information obtained by FNAC must always be correlated with clinical judgment and results of other investigations. The technique is cost effective with low risk and can be performed as an office procedure.[6, 7] This study was conducted to determine the usefulness of FNAC in children at our facility.

METHODOLOGY:

It was a descriptive case series carried out in the Department of Pathology National Institute of Child Health Karachi, from January 2005 to December 2011. The record of patients who underwent FNAC, aged up to 13 year, were retrieved. Specimen from the lesion was obtained using 10ml syringe with 20G needle when located at easily accessible site and by 22G, 90mm disposable lumbar puncture needle when tumors were located in deeper anatomical locations.

Minimum of four slides were made immediately, air dried and fixed with 70 - 90% ethanol. The slides were stained with Leishman and PAP (Papanicolaou) stains. PAS (Periodic acid Schiff) and ZN (Ziehl – Neelsen) stains were used where applicable. If aspirate was enough then the clot was preserved in 10% formalin and processed for histology.

RESULTS:

In seven years a total of 1337 FNAC procedures were performed. The ages of the patient ranged from infancy to 13 year. There were a total of 1067 (79.8%) benign pathologies and 270 (20.2%) malignant lesions. The common benign conditions were chronic inflammation / cold abscess (n=421 - 39.5%) and tuberculosis (n=279 - 26.1%). Other pathologies are shown in table I. Malignant pathologies were found in 270 aspirates of which the most common was various types of lymphomas. In thirty cases precise diagnosis of malignancy could not be made.

DISCUSSION:

FNAC is a good diagnostic tool for identifying nature of pathologies. It provides quick and precise diagnosis in most of the cases. It is an easy technique, though children are usually afraid of needle pricks, but still sedation or anesthesia is rarely needed. For lesions located in deeper tissues sedation may be required. Atropine is recommended for transpleural biopsy to prevent the risk of vasovagal reflex. Local anesthesia is usually not required in superficial biopsies. An anesthetic ointment can be used for biopsy in children but needs to be applied at least half an hour prior to the procedure.

The concern of cancer cells being disseminated along the needle track and early reports of tumor implants at the site of incisional or core needle biopsy puncture has been found to be an exaggerated one. The literature review by Rouseel and by Powers found that the risk of needle track seeding is extremely low when truly fine needles of 20 gauge or less are used.[8,9] Another concern is that preoperative FNAC may cause local tissue changes, which could render subsequent histological diagnosis

Table I: Benign Lesions Diagnosed on FNAC (n = 1067)

S. No	Pathology	Number	Percentage
1	Chronic inflammation / Cold abscess	421	39.5
2	Tuberculosis	279	26.1
3	Reactive Adenitis	130	12.2
4	Post BCG Adenitis	52	4.9
5	Acute Inflammation	44	4.1
6	Benign Inconclusive Tumors	35	3.3
7	Hematoma	34	3.2
8	Lymphangioma	31	2.9
9	Lipoma	30	2.8
10	Thyroid Cyst	08	0.75
11	Gynecomastia	03	0.28

Table II: Malignant Lesions Diagnosed on FNAC (n=270)

S. No	Pathology	Number	Percentage
1	Hodgkin's Disease	64	23.7
2	Non-Hodgkin's, Non-Burkitt's Lymphoma	60	22.2
3	Burkitt's Lymphoma	09	3.3
4	Malignant Histiocytosis	41	15.2
5	Neuroblastoma	17	6.3
6	Round Blue Cell Tumour	13	4.8
7	Rhabdomyosarcoma	12	4.4
8	Nephroblastoma	10	3.7
9	Retinoblastoma	09	3.3
10	Metastatic Nasopharyngeal carcinoma	03	1.1
11	Malignant Teratoma	02	0.7
12	Atypical / Inconclusive Malignancies	30	11.1

difficult. Such changes, include hematoma, infarction, capsular pseudoinvasion etc. However, the biopsy technique should always be careful and gentle in order to minimize tissue damage.

FNAC may not provide sufficient material to oncologists for further assessment of the tumors as material obtained is usually not enough. However clot taken in formaline may be helpful to some extent. In most of the cases the morphological features are so prominent that further investigations or tumor markers may not be required. However in our study malignant cases were re-confirmed histologically and with tumor markers, where applicable. Accuracy of FNAC results in many situations, when reported by experienced and well-trained cytologists can approach that of histopathology.[10] It needs to be emphasized at this point that aspiration cytology is not a substitute for conventional surgical histopathology. FNAC may have a role of simple screening test.

The results of our study showed that the majority of the cases belonged to chronic inflammation / cold abscess in which typical epitheloid cells and giant cells were not found. However ESR, Mantoux test, x-ray chest, clinical features and findings of FNAC and good response to antituberculous treatment gave strong support to the diagnosis of tuberculosis. The yield of tuberculous bacteria on Ziehl Neelsen stain is not convincing.[11] Tuberculosis remained one of the most common conditions diagnosed in our practice on FNAC as reported by others.[12,13,14]

In a study by Veena Maheswari from India, the malignant cases in paediatric age group were around 36%, a figure slightly higher than ours. [15] However, studies from developed Western World gave figures of 40 to 50%.[16-18] In our study on subsequent follow up, in two cases from a total of 130, who were diagnosed as reactive lymphadenitis after symptomatic treatment, were finally diagnosed as non Hodgkin's non Burkitt lymphoma on histology. Lymphomas remained the most common malignant lesions in our series. The cases of malignant histiocytosis in our series were in significant number. This trend needs further research.

From the group of 30 atypical / inconclusive malignancies, 23 cases were followed by biopsies / tumor markers and were finally diagnosed as, Hodgkin's lymphoma (n=4), NHNB lymphoma (n=6), neuroblastoma (n=6), rhabdomyosarcoma (n=4), Ewing's sarcoma (n=2) and reactive lymphadenitis (n=1). This is the weak part of the study as in significant cases diagnosis of malignancy could not be made though suspicion was documented on the presence of atypical cells.

With all the limitations it can be said that FNAC should remain the first line approach for the investigations of suspected malignant / benign tumors. In order to make optimal use of this simple, quick and inexpensive method more efforts should be made to improve the sampling and preparation techniques. There should be an explicit diagnostic criteria and diagnostic errors must be recognized during the procedure that may compromise the results.

CONCLUSIONS:

FNAC provided morphological diagnosis in 96.7% of benign cases and 88.9% cyto-histological correlation was noted in malignant cases. It was relatively painless, inexpensive and gave quick results. In some cases other modalities were needed to make the final diagnosis.

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