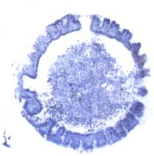
A STUDY OF FINE NEEDLE ASPIRATION CYTOLOGY OF BREAST LUMPS IN THE UNIVERSITY TEACHING HOSPITAL

By

Kasonde Bowa BSc Hb (UNZA) MBChB (UNZA) MSc (Glasgow)

A dissertation submitted in partial fulfilment of the requirements for the award of Master of Medicine (**Surgery**) degree of the University of Zambia



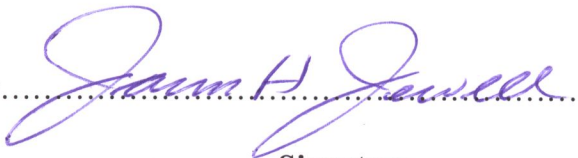
UNIVERSITY OF ZAMBIA

SCHOOL OF MEDICINE

MAY 1999

Supervisors page

The dissertation of Dr Kasonde Bowa is ready for examination.

Signed (Supervisor)..... 

Signature

Dr Jim Jewell FACS FCCP

Senior Lecturer in Surgery

University of Zambia

School of Medicine

Signed (Co-supervisor)..... 

Signature

Dr Victor Mudenda MRCPath

Head of Pathology

Deputy Director

University Teaching Hospital

Approval

This thesis of Dr Kasonde Bowa is approved as fulfilling part of the requirements for the award of the degree of Master of Medicine in Surgery by the University of Zambia , subject to the examiners report

Signatures	date
.....	..... 14/7/00
.....	..... 19/7/2000
.....	.....

Declaration

I hereby declare that this dissertation herein presented for the degree of Master of Medicine **(Surgery)** has not been previously submitted wholly or in part for any other degree at this or any other university nor is it being currently submitted for any other degree,

Signed……..(candidate)

Approved by……(supervisor)

Approved by……(co-supervisor)

Acknowledgement

This project was born from an incidental discussion with Mr Alberto Gregori FRCS(Eng), FRCS (Orth), Senior Lecturer in Orthopaedics and Trauma from the University of Glasgow. It was assessed and modified by the keen intellect of Professor Lawrence Norton MD, FACS, Head of Surgery, University of Colorado United States of America. The technique and reporting of FNAC was supervised by Dr Victor Mudenda, MRCPath, Head of Pathology and Deputy Di:rector of the University Teaching Hospital , Lusaka. The overall work was guided to fruition by of Dr Jim Jewell MD, FACS, FCCP Senior Lecturer in Surgery at the University of Zambia. The credit for this work is shared by them all.

Declaration and Mention

I dedicate this work to my wife Theresa, for whom my constant studying has been a trial. To our daughter Chiku, who always wants Dad home on time and finally to all who have succeeded in adversity, with a belief that I shall soon be one of them. I would like to mention with gratitude the following people without whose assistance this work would not have been completed. Dr Jim Jewell my supervisor who gave the guidance, Dr Victor Mudenda who gave the substance and Mr Desai whose patients these were. Mr Mulenga and Mr Gondwe who prepared the raw research materials. Mr Chewe and his team who helped me to process the research material in print. Finally to all my colleagues in the postgraduate four (PG4) class of 1999 for their challenge and drive. Above all to God who makes it all work out when we aren't quite sure.

Abbreviations

UNIVERSITY TEACHING HOSPITAL	University Teaching Hospital
FNAC.....	Fine Needle Aspiration Cytology
NHSBSP.....	National Health Service Breast Screening Report
UICC.....	The International Union Against Cancer
TNM.....	Tumour Node and Metastasis
FIG.....	Figure
UO.....	Upper Outer
UI.....	Upper Inner
LO.....	Lower Outer
LI.....	Lower Inner
QUAD.....	Quadrant
MALGI.....	Malignant

Terminologies

1. Breast Lump – A three dimensional swelling distinct from the surrounding tissues
2. Fine Needle Aspiration Cytology - The method by which, with the use of a needle and syringe, breast cells are obtained and studied under the microscope
3. Sensitivity - the ability of FNAC to detect a lump as malignant
4. Specificity - the ability of FNAC to detect a lump as benign
5. Inadequacy rate - the total number of acellular aspirates over the total number of aspirates done.
6. Consent rate - the total number of patients who agreed to a procedure over the total number of patients in the study.
7. Predictive Value - the total of actual correct FNAC results over the total number of presumed correct FNAC results

Table of figures

Table of contents

Abstract

This was a prospective study done to assess FNAC as a diagnostic tool in the investigation of breast lumps in University Teaching Hospital. Though this method is inexpensive and has been shown to be highly accurate it is not in common use at this institution.

Seventy three female patients from the surgical outpatient clinic were included in the study. The average age was 25years. Most of the lumps were clinically benign (71%). All the patients consented to FNAC but only 49% went on to have histopathological diagnosis. Of all these 31% were malignant and 69% were benign. The average age of patients with malignant lumps was 30years while that of benign lumps was 24years. Patients above 25years had a higher likelihood of malignancy than those below.

In this study it was found that FNAC had sensitivity of 73% and a specificity of 96% . This level of accuracy compares favourably with other centres in the United Kingdom and meets the quality assurance requirements recommended for the United Kingdom. FNAC was found to be a safe and accurate method of screening and investigating breast lumps in University Teaching Hospital. Guidelines for it's use in University Teaching Hospital are given.

Objectives

A. To study the pattern of Breast Lumps seen in the University Teaching Hospital.

B. To use Fine Needle Aspiration Cytology (FNAC) in the outpatient diagnosis of Breast lump

C. To compare the diagnostic accuracy of FNAC to open biopsy.

D. To make recommendation on the use of FNAC in the management of Breast Lumps in the University Teaching Hospital.

Rationale

The University Teaching Hospital in Lusaka has major financial constraints which restrict the clinical service it can provide. In the management of Breast lumps the lack of mammography has resulted in a large number of biopsies being done[1] . This is not only expensive for the hospital but is a source of morbidity to the patient. The high rate of keloid formation makes for poor cosmesis. Fine Needle Aspiration Cytology is therefore a very necessary technique in this environment, bringing with it several advantages. FNAC is cheap compared to biopsies, it is an outpatient procedure and has very few complications [2] .This study is beneficial to both the institution and the patients. It permits a swift and accurate diagnosis without hospital admission. It enables the screening of patients who really require biopsy, thereby cutting expenditure and improving surgical management.

Literature review

INTRODUCTION

Fine Needle Aspiration Cytology was first used by Kun in 1847 [3,4]. It was introduced it clinical practice in the 1930's by Ellis and Martin [3]. It has been popularised by Zajcek and Franzer in Sweden [3]. It is widely used as a minimally invasive tool, which is highly specific and sensitive. In recognition of this in 1989 the Royal College of Pathologist produced guidelines on FNAC. The intention was to ensure the smooth introduction of FNAC into the National Health Service in the Untied Kingdom[5].

In Africa it's use is not wide spread [1].Mr Yusuf Kodwavalva, in the third Rahima Dawood lecture to the Association of Surgeons of East and Central Africa in 1991 commended FNAC of the Breast as very reliable and cost effective means of investigating Breast Lumps in Africa [6]. In Zambia at the University Teaching Hospital, Bem and Patil have used needle aspiration in the investigation of lymph node pathology [7] . Phiri in review of Breast biopsies found over 500 reported but no FNAC done in 1996 [1].The ministry of health in Zambia is under constant pressure to cut health expenditure. This study investigates the role of FNAC as a cost effective means of investigating Breast Lumps in University Teaching Hospital. This study shows that FNAC is a reliable and useful method of investigating Breast Lumps in University Teaching Hospital

The Breast

History

The record of investigation and treatment of breast lumps goes as far back as 2500 B.C . Imhotep is credited with listing the criteria for the clinical diagnosis [8]. Celsius in 30 A.D established the first simple classification of breast disease [9]. Galen is credited with the first surgical treatment of breast disease. He coined the term crab to describe cancer of the breast between 131 and 203 A.D [9]. Vesalius described the anatomy and modified the concept of breast cancer as a local disease [9] . Virchow introduced the concept of diagnosis of breast disease by histological means in 1857 [9].

Anatomy/ Physiology

The breast lies between the superficial and deep layers of the superficial fascia of the anterior chest wall. It extends from the second to the sixth rib and from the immediate parasternal area to the mid axillary line. It receives it's blood supply from the internal thoracic artery, the lateral thoracic artery and intercostal vessels. It in innervated by the 2 to 4th intercostal nerves. Lymphatic drainage is mostly to the axillary group of lymph nodes and the internal mammary nodes. It is composed of a system of branching ducts with a terminal lobule, which is the functional unit. This system is surrounded by a varying amount of fat and connective tissue. The lobule develops at puberty under the influence of sex hormones and is eventually responsible for the secretion of milk. The breast develops at about 6weeks from an ectodermal ridge from the anterior axillary fold to the groin called the milk line. The breast is an exocrine gland meant for lactation. It has social importance as an organ of feminine sexuality and beauty [9].

Breast lump

Definition

A breast lump is a three dimensional swelling, distinct from the surrounding tissues, and generally asymmetrical in relation to the other breast [10]. Breast lumps can be classified aetiologically or histologically. In a review of the department of surgery Audit figures of 1996 a total of 74 Breast lumps were treated over a one year period from January to December of 1996. Sixty of the lumps were fibroadenomas and 14 were cancers . During this period fibroadenoma was the commonest cause of breast lumps treated in University Teaching Hospital [11].Overall the most common cause of a breast lump seen in University Teaching Hospital is breast abscess[11].

Fibroadenoma

Benign encapsulated breast tumours were first described in 1829 by Sir Astley Cooper. The term fibroadenoma was coined in Germany by Bilroth in 1880. The understanding of this condition has changed over the years and fibroadenoma is now considered an aberration of normal development and involution [11].

Epidemiology

It is the commonest benign tumour of the female breast . Many workers have shown this condition to occur in the early premenopausal period. The peak age of the tumour is between 16 and 25 years [3]. It occurs most frequently in the upper outer quadrant, because this area has a larger breast mass [3]. Foster in his study of 362 breast lumps found the tumour to be more common on the left [12].

Pathology

Two types of fibroadenomas are often described. Small Fibroadenomas and Giant Fibroadenomas. Small fibroadenomas are 2-3 cm in size and large Fibroadenomas are over 12cms in size. Intermediate fibroadenomas are those found in between thes two sizes [12]. Giant fibroadenomas are often confused with phyllodes. The clinical presentation is similar. But the distinction is histological and not clinical.. Phyllodes tumour has branching clefts lined by several layers of epithelium. Haagensen proposes that this condition progresses from a fibroadenoma ,and that the two conditions are the opposite spectrum of the same disease [3]. The histological distinction of pericanalicular and intracanalicular ,is now infrequently used, because quite commonly these lumps present with the two in the same lump [13]. These lumps are well encapsulated compressing the rest of the breast tissue around them. This makes them very mobile and have earned them the name " Breast mouse".

Aetiology

The cause of fibroadenoma is poorly understood. It has been noted that these tumours are most common at the onset of menstruation when oestrogen levels are high. These tumours also arise from the lobules of the breast [14] . Moran reported that they tend to increase during pregnancy[12].

Clinical

Fibroadenoma presents with a painless mobile lump, discovered by accident. The tumour is estimated to double in 6 to 12 months and reaches a static level at 2 to 3 cms [12]. Some workers have shown that left untreated 12% undergo spontaneous regression [15]. Foster

and others have shown a tendency of reduced cellularity with patients over twenty years [12]. Fibroadenoma may present as multiple lumps. Between 5 -16% of all fibroadenomas are said to be multiple [16]. Juvenile fibroadenomas are large fibroadenomas which present with rapid growth and may reach large sizes. This tumour occurs in early puberty and is often mistaken for a Phyllodes tumour_ [17]

Treatment

The treatment is based on the stage of the lump and the age of the patient. If the lump is small, less then 3 cm. It is likely to remain static or regress. It also cause minimal distortion if any of the breast. A breast lump less then 3cm in a patient below 35 yrs is treated conservatively with serial follow up [18]. In patients older then 35yrs breast lumps of any size should be treated by excision and histopathology [12]. Large or rapidly growing fibroadenomas (Giant Fibroadenoma), should be excised. Intermediate fibroadenomas in women less then thirty five years,need regular follow up and subsequent excision if the lump increases in size [3].

Phyllodes Tumour

This tumour was first described by Johannes Muller in 1838. He gave the lesion this name because of the leaf like projections into the cystic cavities within the tumour. It is most often benign but shows potential for malignancy [3].

Epidemiology

In a study of 68 patients Haagensen showed the average age to be forty years. He noted that this tumour does occur also in younger age groups but less frequently so [3]. Phyllodes tumour are mostly unilateral and rarely bilateral [19] [20]The tumour usually exceeds 10cms in diameter. A few are small. Two varieties are seen ;

A. Slow growing benign type of tumour and

B. the rapidly growing malignant type of tumour.

Pathology

The diagnosis should always be a histopathological one rather then a clinical one. The tumour compresses the surrounding tissue with limited microscopic infilteration. Skin ulceration which is often seen is the result of pressure necrosis rather then invasion. The histological appearance is of branching clefts lined with a multilayered epithelium. The stroma is more cellular then in fibroadenoma, and the stroma predominates over the epithelial component. Malignant phyllodes tumour has an infilterative margin and disproportionate growth of stroma. Cells show marked nuclear pleomorphism. Twenty – five percent of the tumours are malignant or of borderline nature and recur after excision or spread locally. A few metastase through the blood stream to the lung and bone. Lymph node metastasis is rare[13].

Treatment

The treatment of phyllodes tumour depends on the type. Benign tumours are treated by wide local excision . Malignant phyllodes tumours and those that have recurred by simple mastectomy[13]. These tumours do not respond to chemotherapy nor radiotherapy.

Cystic Disease and Benign Epithelial Hyperplasia

This condition includes a wide range of ill defined conditions in which multiple pathologies co-exist. Various names have been used for this condition including, fibroadenosis, mammary dysplasia and cystic mastitis. The term ANDI has recently come into common use to encompass these pathologies [21]. It stands for Aberrations of Normal Development and Involution. This condition is characterised by ;

1. Cyst formation

2. Adenosis- proliferation of breast acini

3. Epitheliosis - proliferatiom of epithelial cells

4. Pain - this is period related (Cyclical) or not period related (Non- cyclical).

Epidemiology

It is a condition of the late pre-menopausal and menopausal women. Often appearing between 35-50yrs of age. The patients present with bilateral lumpy breasts with or without pain.

Pathology

These lumps are usually in the upper outer quadrant and less then 4cm. There are no features of fixity or skin involvement. Macroscopically the lesions are white and firm with small cysts. The histological features are variable with combination of fibrosis, cysts, adenosis and epithelial hyperplasia [13]. There is an increased predisposition to malignancy [22] in these lesions. It is said to be 2 to 3 times that of normal breast [22].

Treatment

This depends on the features that are predominant. Cysts are aspirated dry and contents sent for cytology. If they refill they are excised. Fibrous lumps are excised. Pain is treated medically with bromocryptine, danazol or contraceptive pills.

Simple Breast Cysts

This type of lesions is commonly grouped with cystic disease and not given it's true place. The cysts in cystic disease are small less then 3mm [3]. Cysts are those sometimes called "Gross Cysts" [3]. These cysts exceeds 3mm in size. These were first described by Sir Astley Cooper in 1840. It was elucidated further by Sir Benjamin Brodie

in 1846. Phyllodes is eponymously called the serocystic disease of Brodie.

Epidemiology

Cysts are noted most frequently between the ages of 30 and 50yrs. They are rare below 25yrs. In a study of 2382 cases Haagensen showed 36.4% to be on the left side. Half were single and the other half were multiple.

Pathology

Cysts are of many varieties and many histological pictures. Some cysts fuse forming a multiloculated cyst. Most large cysts lose their epithelial lining and the inner surface is granular. New cysts may have straw coloured fluid, while older cysts have darker thicker fluid. The aspirate when studied is found to contain degenerating epithelial cells and formless debris. The cytology can be difficult to interpret. Cells are best taken after the cyst is collapsed, from the wall of the cyst.

Treatment

The primary treatment of breast cyst is to aspirate them dry. If they do not recur nothing further is required. When there is recurrence biopsy should be taken. If this is benign, follow up is all that is required. Foote and Stewart have reported a high incidence of malignancy associated with breast cyst [13]. When this is present treatment is the same as any other malignancy of the breast [13].

Intraductal Papilloma

This condition most commonly presents as a bloody nipple discharge

rather then a lump. They occur most commonly in middle aged women of 40-50yrs [13]. They are most often solitary but may rarely be multiple.

Pathology

The papilloma arises from a mammary duct it tends to compress and elongate the duct. It has a vascular core with double layered epithelium. Haemorrhage occurring within the papilloma is the cause of nipple discharge that is often seen.. Histologically the ducts appear to be stretched and invaded by protrusions with a leaf like vascular core.

Treatment.

The intraductal papillomas are treated by local wide excision or cannulation of the offending duct, with subsequent excision (Microdochectomy).

Carcinoma of the Breast

This is the commonest cancer of women in developed countries [21]. The average annual incidence ranges from 10 to 80 per 100,000 females [3]. An increase in the annual mortality rates for breast cancer has been noted, this is the result of improved reporting or a real change is uncertain [3]. In Connecticut in the USA the incidence has increased since 1935 by almost 100%, while the mortality rates have remained fairly constant[23]. The word cancer is derived from the description of breast cancer by Galen(131-203AD). He described it as a crab with legs extending into surrounding tissues[9].

Aetiology

The aetiology is multifactorial. It is environmental and genetic. Genetic linkage studies have shown an abnormality in the short arm of chromosome 17 and mutations in the p53 tumour suppresser gene [21]. Geographical location, age, gender diet and hormonal factors have all been implicated as a factor [21].

Pathology

Cancer of the Breast arises from the ducts in over 90% of cases [21]. In contrast to fibroadenoma which arises from the lobules [14]. Cancer of the breast most commonly occurs in the upper outer quadrant and is more common in the left then the right breast [3]. Stewart and Foote in 1948 provided a pathological classification which is still in common use [13]. They classified cancer of the breast as either arising from the duct which comprise over 90% of all types of breast cancer, or from the lobule. The classes are as follows:

A. Non invasive intraductal carcinoma

B. Invasive intraductal carcinoma

Cancer arising from the lobules makes up 10% of all cancers of the breast, and they are classed as follows:

A. Non invasive lobular carcinoma

B. Invasive lobular carcinoma

Invasive intraductal carcinoma presents with various histological subtypes some of which are scirrhous which is the most common subtype comprising 75% medullary , colloidal and tubular (these tend to have a good prognosis). Pagets disease and inflammatory carcinoma are unclassified in this system. Bloom and Richardson gave a histological grade of malignancy, and classified them into 3 grades [13]. Low grade malignancy, medium or high grade malignancy. Scirrhous carcinoma has a gritty consistency. The histological structure is heterogenous comprising sheets and columns of pleomorphic epithelial cells with variable differentiation. The cells infilterate the surrounding fibrous stroma. Cancer of the breast spreads by four means:

1, local spread

2, lymphatic spread and

3, spread by the blood stream.

4. Transcoelomic spread

Staging

For the purpose of treatment various means of staging cancer of the breast have been devised over the years. In 1940 at the Christie Hospital and Holt Radium Institute in Manchester, the Manchester system of staging was devised. This is in common use in the Unitied Kingdom [13]. The classification is based on a clinical assessment of the extent of carcinoma spread [13]. At the Presbyterian Hospital in the USA Stout and Haagensen proposed the Columbia system of staging which is commonly used in North America [3]. The international Union Against Cancer (UICC) in 1954 initiated the Tumour Node and Metastasis (TNM) classification for cancer of the breast. This classification is detailed and common use by researchers in this field [13].

Clinical Presentation

Cancer of the breast presents most frequently as a painless swelling in the breast in women over 35years [21]. Often the lump is discovered accidentally by the patient herself. Twenty percent of patients will present either with locally advanced disease or distant metastasis [21]. Inflammatory carcinoma presents in about 2 to 3 % of all cases [13].

Treatment

The management of cancer of the breast is based on it's stage. Manchester stage 1 and stage 2 are regarded as local disease and curable. The treatment is surgery with radiotheraphy. Simple or Modified radical mastectomy [24] is prefferred to more radical surgery [25] the outcome has been shown to be similar with greater morbidity in the latter [21]. The outcome in local disease is between 71-84% survival in 5 years [21].

Stage 3 and 4 are regarded as systemic disease and not curable. The treatment is palliation. Postmenopausal women in this stage are treated with hormonal therapy. Tamoxifen has been used with good success. Premenopausal women are treated by oophorectomy or medical adrenalectomy using aminoglutethimide [26]. Chemotherapy and high doses steroids are used when these methods fail [26]. The role of surgery in systemic disease is minimal[9]. The 5 year survival in advanced disease is between 18-48%.

Prognosis

The Nottingham Prognostic index is used to determine prognosis. The factors that determine prognosis are:

1. The nature of the tumour that is the size, histology and stage.
2. The invasiveness of the tumour that is the lymph node status, if there are more then four lymph nodes affected the prognosis is poor.
3. The receptor status
4. The sex. The prognosis poorer in males [9]

Investigation

A battery of various investigations have been devised for breast lumps. This serves to show the importance attached to this disease and the high incidence of cancer of the breast. The investigations in common use are mammography, ultrasound, biopsy , trucut biopsy and fine needle aspiration cytology.

Mammography

Mammography was first performed in 1913 by Saloman a German surgeon. It was popularised by Vogel in 1932. It has gained wide acceptance and is one of the most commonly used medical test, in developed countries [3]. Mammography is a soft tissue radiograph of the breast , taken by placing the breast in contact with an ultrasensitive film, then exposing it to low voltage x ray [21].

Indications

The common indications for mammography are the following

1. As a screening test for women predisposed to cancer of the breast.This may be due to any of the following: family history, history of breast cancer , in women over 45years and patients with premalignant conditions of the breast.
2. Patients with bloody nipple discharge with no palpable breast lump
3. Patients over 35years with a palpable breast lump.
4. Patient with suggestion of local or distant cancer spread with no definite breast lump (occult breast cancer).

The interpretation of a mammogram can be difficult even in the hands of experienced radiologists [10]. In general, changes in the skin, the breast substance and specific soft

tissue character of the lump itself are used to determine wether a lump is benign or malignant [21]. The high density in young women make it difficult to interpret in women less then 35years of age [10]. A combination of physical examination and mammography increases the sensitivity to 95% and the overall accuracy to 77%[10]. Mammography is now only used as a preliminary test and definitive treatment cannot be based on this investigation alone [10].

Ultrasound

With the development of ultrasound imaging, the breast was one of the first organs to be studied. Wild and Reid in 1952 used A mode technique. This was followed by Howdry in 1954 in the USA, Jenkins 1971 in Australia and Kobayashi 1975 in Japan. These workers showed the value of ultrasound in distinguishing solid from cystic lumps of the breast [29]. The greatest breakthrough was the development of a transducer using 8 probes to enhance resolution. This was developed in Australia at the Royal North Shore Hospital in Sidney [28].

The principle of ultrasonography is the generation of high frequency sound waves between 1- 15mega Hertz. The reflections of various tissues produces echoes which are mechanical vibrations. These vibrations are converted to electrical impulses which are amplified and displayed as images on the screen.

Indications

Ultrasonography inspite of the high expectation of wide usage in earlier years, is commonly used to compliment mammography and physical examination[10].

The indications for it's use are;

1. to distinguish solid from cystic masses
2. As a guide to the lump in needle aspiration of impalpable lumps

3. Where mammography is contraindicated. Such as pregnant women.

4. Women under 35years, were the density of the lump makes interpretation difficult.

In general ultrasonography has little place in the investigation of breast lumps. It cannot distinguish benign from malignant lumps and is never used as the definitive tool for the diagnosis of breast lumps [30]

Thermography

This is a method of measuring the body heat by forming a pictorial figure based on the surface temperature. The principle is that a malignant lesion will be more vascular and generate a higher surface temperature [31]. The equipment consist of a scanning system connected to a screen. Thermography has been shown to have a very low sensitivity and specificity [32]. It's value as an investigative tool is questioned by some.

Computerised Axial Tomography and Magnetic Resonance Imaging

CT scan and MRI are currently not considered to be of value in the investigation of breast lumps [33]. They are too expensive and only distinguish solid from a cystic mass. This is more cheaply done by Ultrasound. MRI has the advantage of no irradiation and the ability to resolve lumps as small as 2mm in size. The cost effect ratio is too high for it to be of any value at the current time [10].

Open Biopsy

This is the definitive method of breast lump assessment. So long as a representative sample is obtained [34]. Even the originators of cytology admit that the ultimate tissue diagnosis is histological and not cytological [35]. However the problem and expense associated with biopsy makes the preliminary use of cytology very attractive [10]. The added advantage of cosmesis, speed and outpatient testing reinforce the argument for

routine cytology over routine biopsy [29].

Fine Needle Aspiration Cytology

Cytology

In 1928 George N Papanicolaou, an anatomist introduced the concept that malignancy can be diagnosed using cellular material spread on a slide. Over the years the claims were hotly disputed by pathologists [36]. It was not until 1943 when George Papanicolaou's landmark work describing preparation and staining, that cytology was accepted as a diagnostic tool [37]. Other workers in this field include the Rumanian aUniversity Teaching Hospitalor Babes. He was the first to publish work on gynaecological cytology. Leopold G Koss is also credited for his work in this field [38]. Cytology has gained acceptance and attained routine usage in cervical pap smears. It has several varied usages in medicine and science, some of which are the following;

1. Evaluation of inflammatory lesions
2. Identification of microbiological organisms.
3. Evaluation of cytohormonal effects on cells
4. Genetic studies
5. Follow up of therapy and assessment of malignancy

Schaumann states that cytology is severely under utlised [36]. It's use has however grown rapidly. Almost all organs accessible by a needle are and can be investigated by cytological means. This includes prostate , lymph nodes [7], bones , thyroid , lungs, gastrointestinal tract and the eye [29] . In the University Teaching Hospital extensive work has been done on cytology of lymph nodes by Mr Chris Bem [7], he recommended the routine use of needle aspiration of lymph nodes instead of biopsy in the investigation of lymphadenopathy.

Cytology of the Breast

Fine needle aspiration cytology (FNAC) for was first used at the memorial hospital in New York by Ellis and Martin in 1930 [37]. In 1933 Stewart recommended it's use to defferentiate benign and malignant lumps [39]. It was vary slow to develop in the USA due to fear of cancer dissemination through the needle track. In Sweden Franzen and Zajicek popularised FNAC in the 1950's. Together with physical examination and mammography it became known as the triple assessment. In the third Rahima Dawood Memorial Lecture to the Association of surgeons of East and Central Africa (ASEA) in 1991, Mr Yusuf Kodwavwala strongly endorsed FNAC as the best diagnostic tool in the treatment of breast cancer[9].

In the Unitied Kingdom, the Royal College of Pathologist recognising the importance of FNAC in the treatment of breast lumps, introduced in 1989 guidelines for FNAC reporting [5]. This was to facilitate the uniform reporting of cytology in all NHS hospitals in the UK [5].

Indications

De Freitas states that there are several indications for the use of FNAC [39]. The following are the common indications for it's use;

1.Diagnosis and treatment of breast cyst [3]

2.Diagnosis of breast abscess and distinguishing it from inflammatory carcinoma of the breast [39].

3. Diagnosis of breast lumps in young women and subsequent follow up [10].

4. As a screening test for all breast lumps. It is cheaper , has less side effects and more accurate in all age groups then mammography [5] . [10].

5. As a preliminary test for the diagnosis of cancer of the breast [39].

6. De Freitas states that the most important indication is the investigation of

premenopausal women (less then 40years) who present with unilateral nodularity of the breast. In these patients FNAC is more sensitive then mammography and physical examination combined [38].

Method

The method has changed little since it's first description by Zajicek and Franzen in 1950's [40]. Some modifications have occurred in some of the equipment used [38] the procedure is essentially the same. To enhance accuracy of sampling, ultrasound has been used to localise the lump during aspiration. Stereotatic needle guided aspiration which is still regarded as a research tool is the latest in this line of development [5].

Technique

The basic technique as described by Zajicek involves, fixing the lump between the thumb and the index finger of the left hand to steady the lump. The lump is penetrated with a 21 or 23 gauge needle and aspirated using a 10ml syringe. The contents in the needle are sprayed onto a clean glass slide which is spread thinly and air dried. It may also be fixed with alcohol [30]. The slide maybe stained with Papaniculaou, Giemsa, or May Grunewalds stain [39].

Reporting

The Royal College of Pathologist has recommended since 1989 a method of reporting FNAC [5]. There are 5 categories of reporting:

C1 = Inadequate sample. This means less then 5 clumps of epithelial cells are seen on the whole.

C2 = Benign. Indicates an adequate sample showing no evidence of malignancy.

C3 = Atypia, probably benign. As above, except in addition certain features not commonly seen in benign aspirate.

C4 = Suspicious of malignancy. The cytologist thinks the material is not clearly malignant.

C5 = Malignant. Adequate sample containing cells characteristics of malignancy.

For detailed guidelines appendix is attached. Reporting is based on three criteria that is, the cell character, the nucleus and the general cell environment/ behaviour [5].

Results

Literature on the sensitivity, specificity and accuracy of FNAC is abundant [10]. William Frable in reviewing some of this literature totaling over 1,500 FNAC found sensitivity and specificity of over 90%[41]. Lanin in his study found an accuracy of 96% [2]. In reviewing over 4,000 cases in the literature Hammond found an accuracy of between 89% to 99% [42]. Grant and his associates at the Mayo Clinic reviewed a total of 10,917 and found that FNAC was an important method of assessing breast masses [43].

FNAC compares very favourably with other investigative tools in the assessment of breast lumps [10]. Physical examination of breast alone is correct in between 60% to 80% of cases, when done by experienced clinicians [44]. It has a sensitivity of 88%, specificity 71% and accuracy 81%. Mammography alone has a sensitivity of 94%, specificity of 55% and an accuracy of 73% [10]. The combination of mammography and physical examination is more sensitive, but it is not always more specific or accurate. Van Damm found the specificity to be 51%, sensitivity 95% and accuracy of 77% when they combined these two techniques [10]. The combination of mammography, physical examination and FNAC is regarded has highly accurate when the three methods agree[10]. A large number of surgeons consider this triple assessment sufficient to undertaken radical operations [45], [46].

In fact some workers have been so impressed by the accuracy of FNAC in

their institution that they consider an excisional biopsy or frozen section unnecessary. They proceed to perform surgery based on a FNAC report [46]. FNAC has been shown to have several advantages. It is an outpatient procedure, quick and free of complications [41]. It gives the patient and physician ample time for consultation before definitive surgery [2]. It is also less expensive than other methods of assessment. Lanin showed that in East Carolina School of Medicine the cost of inpatient biopsy was $1410 plus or minus $262, while FNAC would cost $75. He states that even if the patient has to have open biopsy after FNAC, the overall cost is markedly reduced. This is because it prevents unwarranted biopsies [2].

Conclusion

It is generally agreed that FNAC is a sensitive, specific and accurate means of investigating breast lumps [10]. It has only a few opponents [41]. It is cost effective [2] and free of any major complications [29]. The techinque however is dependent on good cytolopathology services [44]. It has a learning curve and is therefore dependent on the experience of the aspirator and the cytologist[44].

Patients and methods

Patients

A special outpatient clinic was set up in the University Teaching Hospital in the surgical clinic for the study. All patients were seen from the onset by the author until final discharge. For inclusion in the study the patient had to have a palpable lump. A lump was defined as a distinct asymmetrical swelling which is palpable [10]. Patients with previous breast surgery were excluded from the study. Fine needle aspiration was done at the first visit. The patients was reviewed and given results 2 weeks later. If the patient consented a biopsy was done at the earliest convenient time. A detailed research data sheet was filled by the author including the personal , clinical, cytological and biopsy result (appendix).

Technique

Fine needle aspiration was used as described by Parsons [29]. The skin was prepared with spirit after obtaining consent from the patient. The lump was held between the thumb and index finger of the left hand to stabilise it. No anaesthesia was used. A 21G (Green hub) or 23G (Blue hub) needle was used on a 10ml syringe. If the lump was deep seated a 21G needle was used if it was superficial 23G needle was used. The needle was inserted into the lump with the syringe attached. Negative pressure was then applied by pulling the plunger to the 10ml mark. Three to four draws were made in the substance of the lump. The tip of the needle was moved in the lump. This allowed different areas to be sampled and cells to be detached into the lumen of the needle. The needle and syringe were then withdrawn. The aspirate was sprayed onto a clean glass slide and spread thinly. This was air dried for up to 10minutes. A minimum of 2 slides

Patients and methods

Patients

A special outpatient clinic was set up in the University Teaching Hospital in the surgical clinic for the study. All patients were seen from the onset by the author until final discharge. For inclusion in the study the patient had to have a palpable lump. A lump was defined as a distinct asymmetrical swelling which is palpable [10]. Patients with previous breast surgery were excluded from the study. Fine needle aspiration was done at the first visit. The patients was reviewed and given results 2 weeks later. If the patient consented a biopsy was done at the earliest convenient time. A detailed research data sheet was filled by the author including the personal , clinical, cytological and biopsy result (appendix).

Technique

Fine needle aspiration was used as described by Parsons [29]. The skin was prepared with spirit after obtaining consent from the patient. The lump was held between the thumb and index finger of the left hand to stabilise it. No anaesthesia was used. A 21G (Green hub) or 23G (Blue hub) needle was used on a 10ml syringe. If the lump was deep seated a 21G needle was used if it was superficial 23G needle was used. The needle was inserted into the lump with the syringe attached. Negative pressure was then applied by pulling the plunger to the 10ml mark. Three to four draws were made in the substance of the lump. The tip of the needle was moved in the lump. This allowed different areas to be sampled and cells to be detached into the lumen of the needle. The needle and syringe were then withdrawn. The aspirate was sprayed onto a clean glass slide and spread thinly. This was air dried for up to 10minutes. A minimum of 2 slides

were made for each patient. The slides were stained with Giemsa and labelled.

Giemsa Staining

The slides were fixed in alcohol to ensure the cells were not washed off during the staining process. A protocol is provided in appendix . The cells were stained in Giemsa stain and differentiated in acetic acid . This technique produces purple to pink nucleus with a faint blue cytoplasm. It was preferred because it is simple and available in the University Teaching Hospital laboratory. The staining was done by the author and the senior laboratory technician.

Reporting

The slides were reported by a consultant pathologist with special interest in breast cytology. The consultant is a member of the Royal College of Pathologists in England, and has done breast cytology at University College London department of pathology for over 10 years. The slides were reported using the National Health Service Breast Screening Project (NHSBSP) guidelines (Appendix). Photograph 1 and 2 show examples of benign and malignant smears taken from some of the prepared cytology slides.

Biopsy

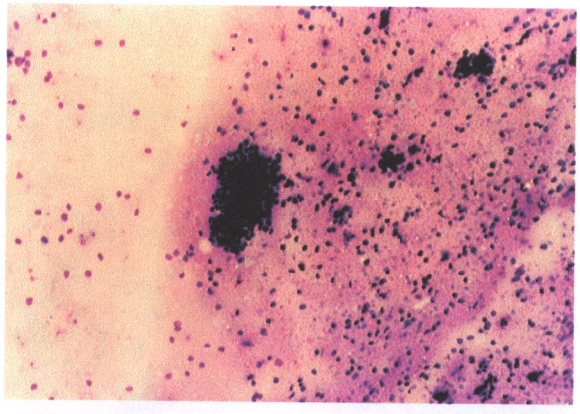
Biopsy was done by the author or a postgraduate student in surgery up to the rank of registrar. Consent was obtained for biopsy and the operation done in theatre under local or general anaesthesia depending on the size and site of the lump The specimens were sent to the laboratory and prepared routinely. The sections were stained with haematoxylin and eosin. Two consultant pathologists read the slides independently of each other and the FNAC result. All the data was pooled and analysed with the advise

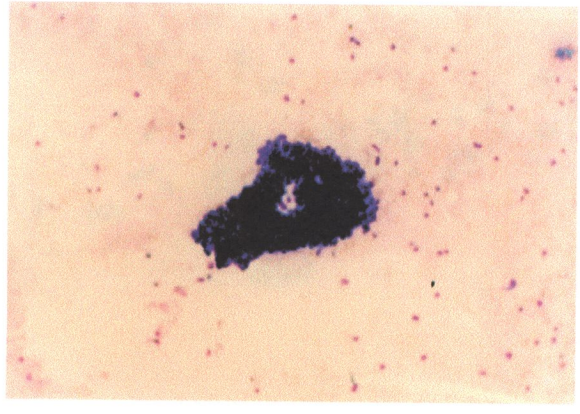
of a medical statistician. The tissue report was taken to be definitive and the final correct diagnosis of any breast lump.

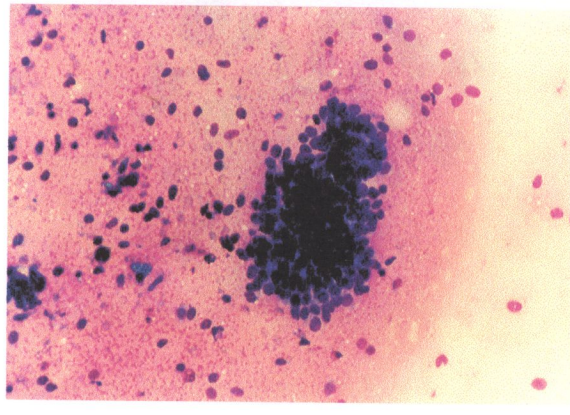
Statistical Methods

To determine the level of accuracy in the diagnosis of Fine Needle Aspiration cytology sensitivity, specificity and predictive value were worked out. The sensitivity was defined as the number of malignancies identified by FNAC over the total number of malignant lumps as demonstrated by open biopsy. This was worked out as a percentage. Specificity was worked out as the number of benign lumps as shown by FNAC over the total number found by open biopsy, this was also expressed as a percentage. The predictive value is the ratio of the number of times FNAC was correct over the total number of either negative or positive FNAC results. This was multiplied by 100 to get a percentage.

PHOTOGRAPH SET 1

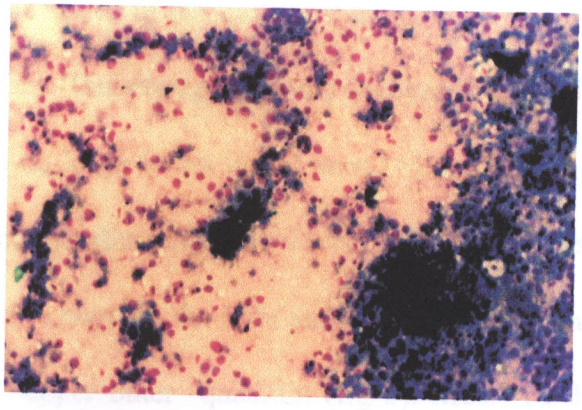


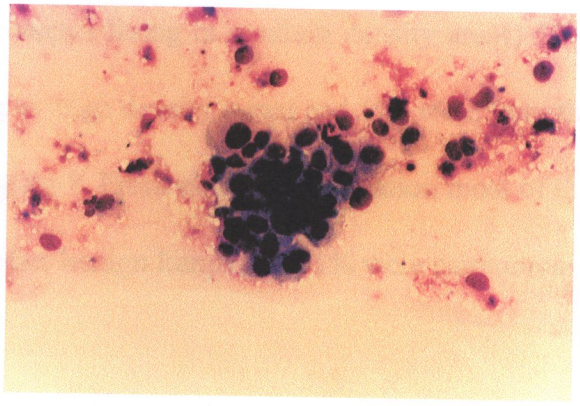


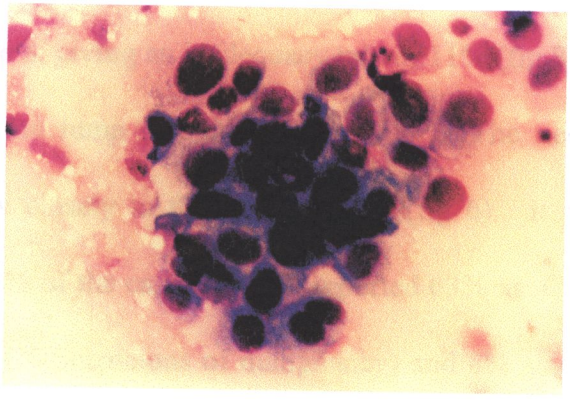


This group of photo shows benign cytology stained with Giesma stain, the cells are viewed at X4, X10 & X20 magnification. The cells are of two types, they are clumped and cohesive. The nucleus is dormant.

PHOTOGRAPH SET 2







This group of photo shows FNAC of malignant cytology stained with Giesma stain, the cells are viewed at X4, X10 & X20 magnification. The cells are large independent, the nucleus is active with prominent nucleoli, no bare cells are seen.

Results

A total of 73 patients were included in the study. All the patients were female. The age range was from 13yeats to 51 years. The average age was 24.6years. Most of patients were below 20years fig 1. There were no large breast lumps seen (>12cm). Half the lumps were small (<3cm) and the other half intermediate size, (4 - 11cm) fig 2. There was an equal distribution of the side of the lump. 50.6% were on the right and 49.4% were on the left (fig 3). 34% of all the lumps were in the upper outer quadrant (fig 5). Most of the patients seen were classed as middle class (patients living in medium density areas) 59%, 36%were from the lower class (patients living in high density areas) and 5% were from the upper class (patients living in low density areas) fig 7. From clinical examination most of the lumps were benign, 71% fibroadenoma, 18% other benign lumps and 11% were carcinomas'(fig 4).

FNAC was done on all the patients with an acceptance level of 100%. The number of unsuccessful aspirates were 8, giving an inadequacy rate of 11% (fig 8). It was noted that this was most frequent were the lump was smaller than 1cm. The needle feel and aspirate appearance compared very closely to the FNAC result (fig 6). It predicted correctly the FNAC result broadly in 89% of the cases. FNAC reported 63% as C2 (Benign), 14% as C3 (Benign atypical) , 4% as C4(Suspicious of malignancy) and 8% as C5 (Malignant). Thirty six of the patients agreed to have biopsy done , which was an acceptance rate of 49%. Histology showed that 11 patients had cancer of the breast (31% all patients biopsied) fig 9. Ten of these were ductal carcinoma. Twenty five patients had benign lesions (69% of all the patients). The age range for patients with malignancy was 24 to 50 years. The average age was 31 years. There was one patient under 25years , while the other 10 were over 25years. Of

the patients with benign lumps, 80% were under 25years only 20% were over 25years old. The average age for benign lumps taken for biopsy was 2lyears. The test was 96% sensitive for benign lesions and 73% specific. While it was 73% sensitive for malignant lesions and 96% specific (fig 11).

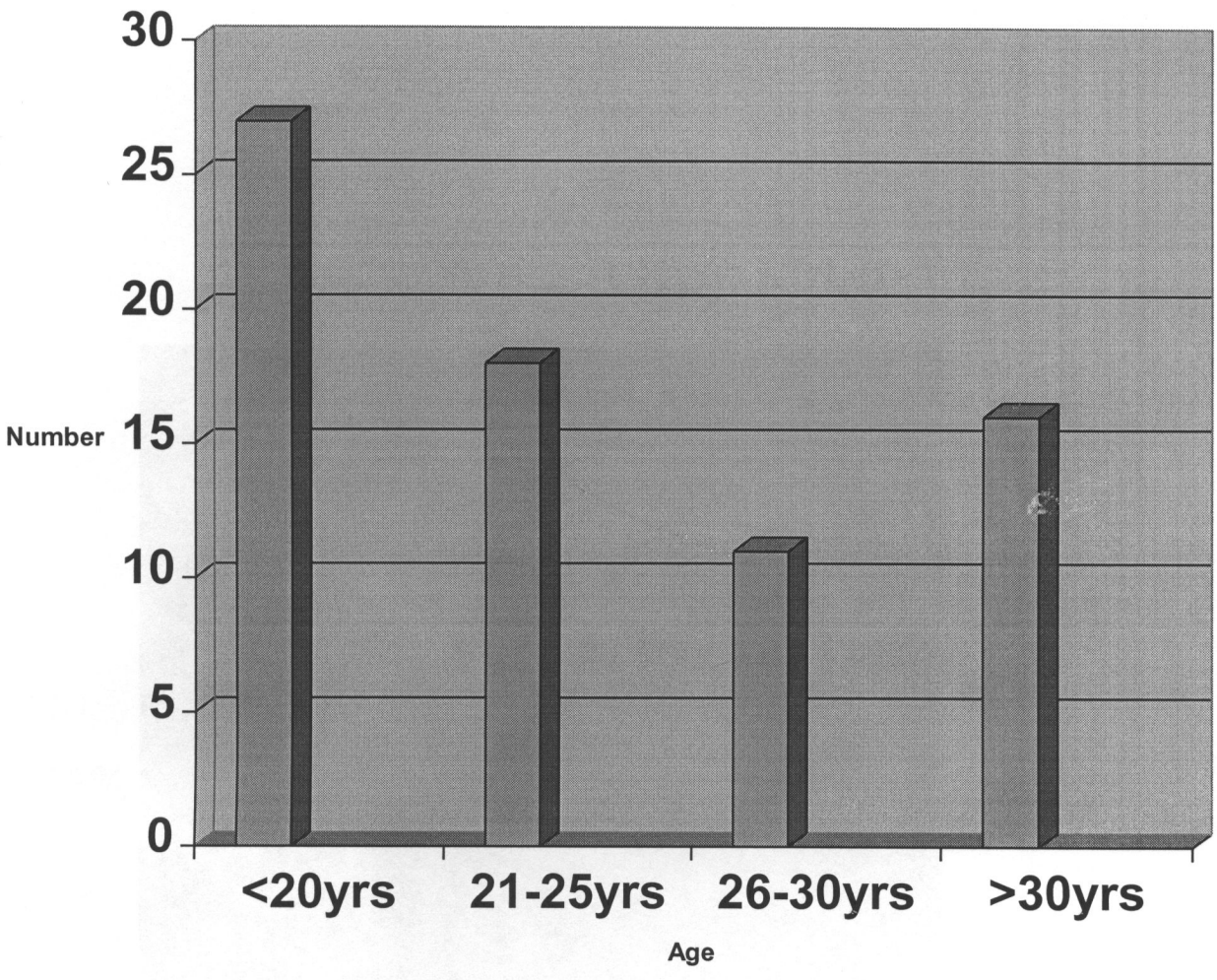

Age at Presentation
30
25
20
15
10
5
0
Number
<20yrs
21-25yrs
26-30yrs
>30yrs
Age

Figure 1

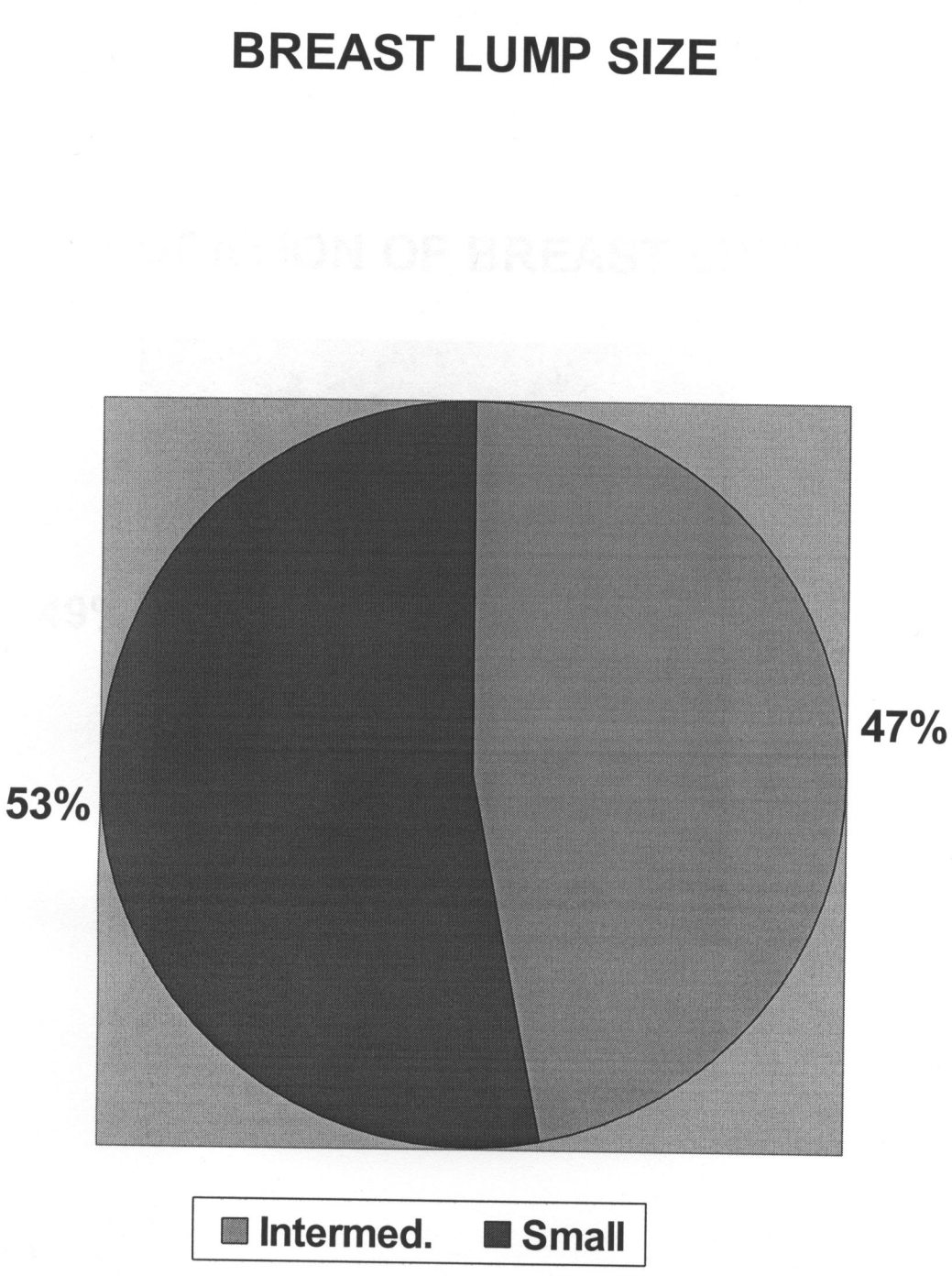


Figure 2

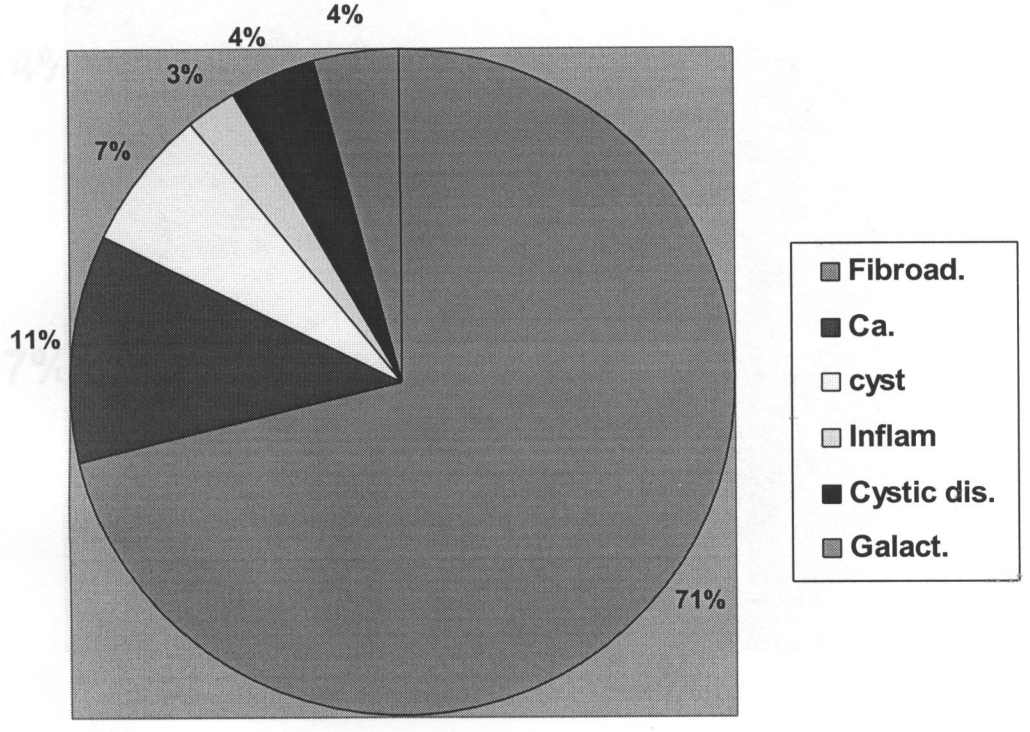

CIINICAL DIAGNOSIS
4%
4%
3%
7%
11%
71%
Fibroad.
Ca.
cyst
Inflam
Cystic dis.
Galact.

Figure 4

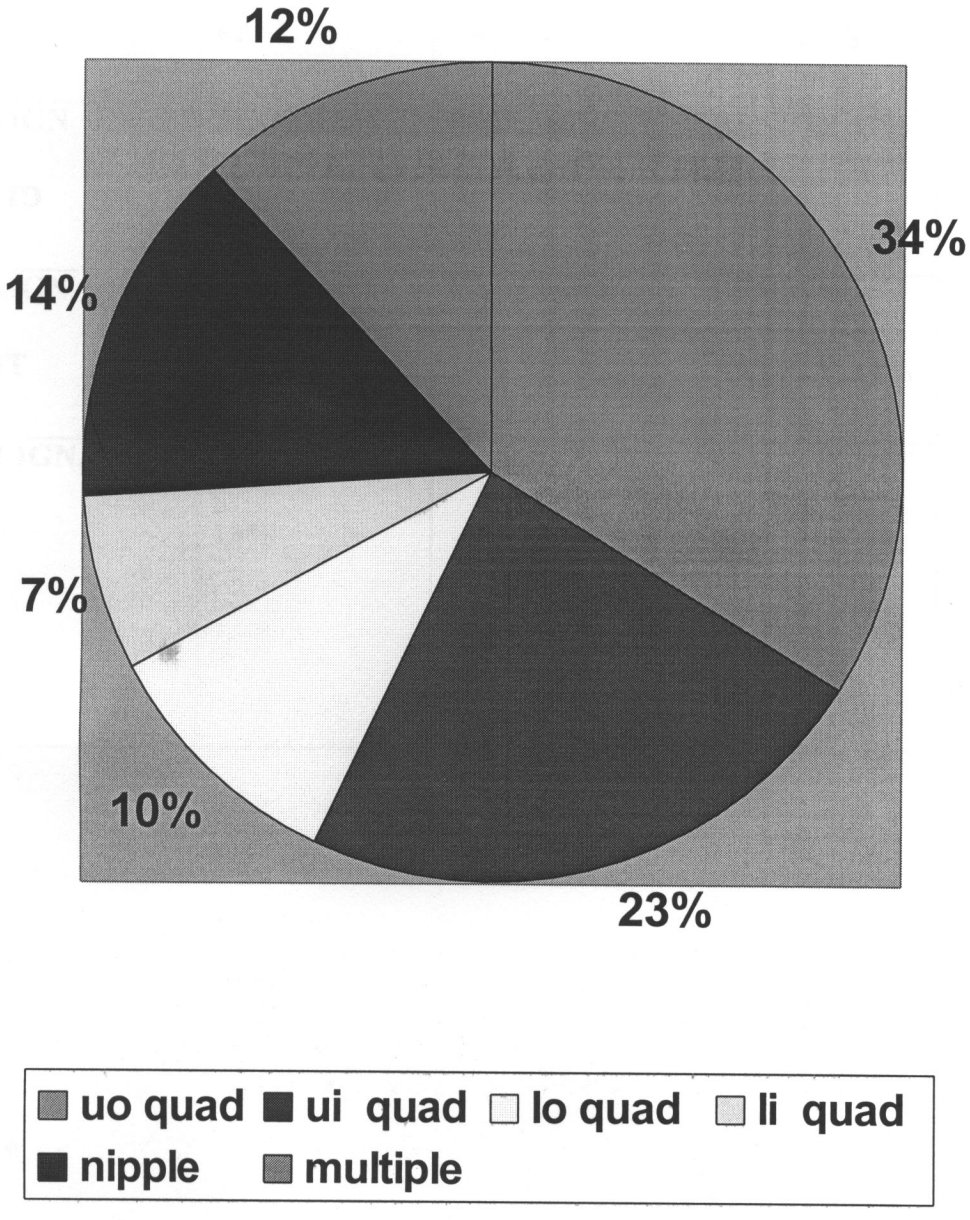

SITE OF BREAST LUMP
12%
34%
14%
7%
10%
23%
uo quad
ui quad
lo quad
li quad
nipple
multiple

Figure 5

NEEDLE FEEL AND DIAGNOSIS

	NEEDLE FEEL	ASPIRATE	FNAC DIAGNOSIS
BENIGN SOLID	FIRM 68%	PINK 68%	BENIGN 63%
BENIGN CYST	SOFT 14%	VARIABLE 14%	BENIGN ATYPIA 14%
MALIGNANT	VARIABLE 18%	BLOODY 18%	MALIGNANT & SUSPICIOUS 12%

Figure 6

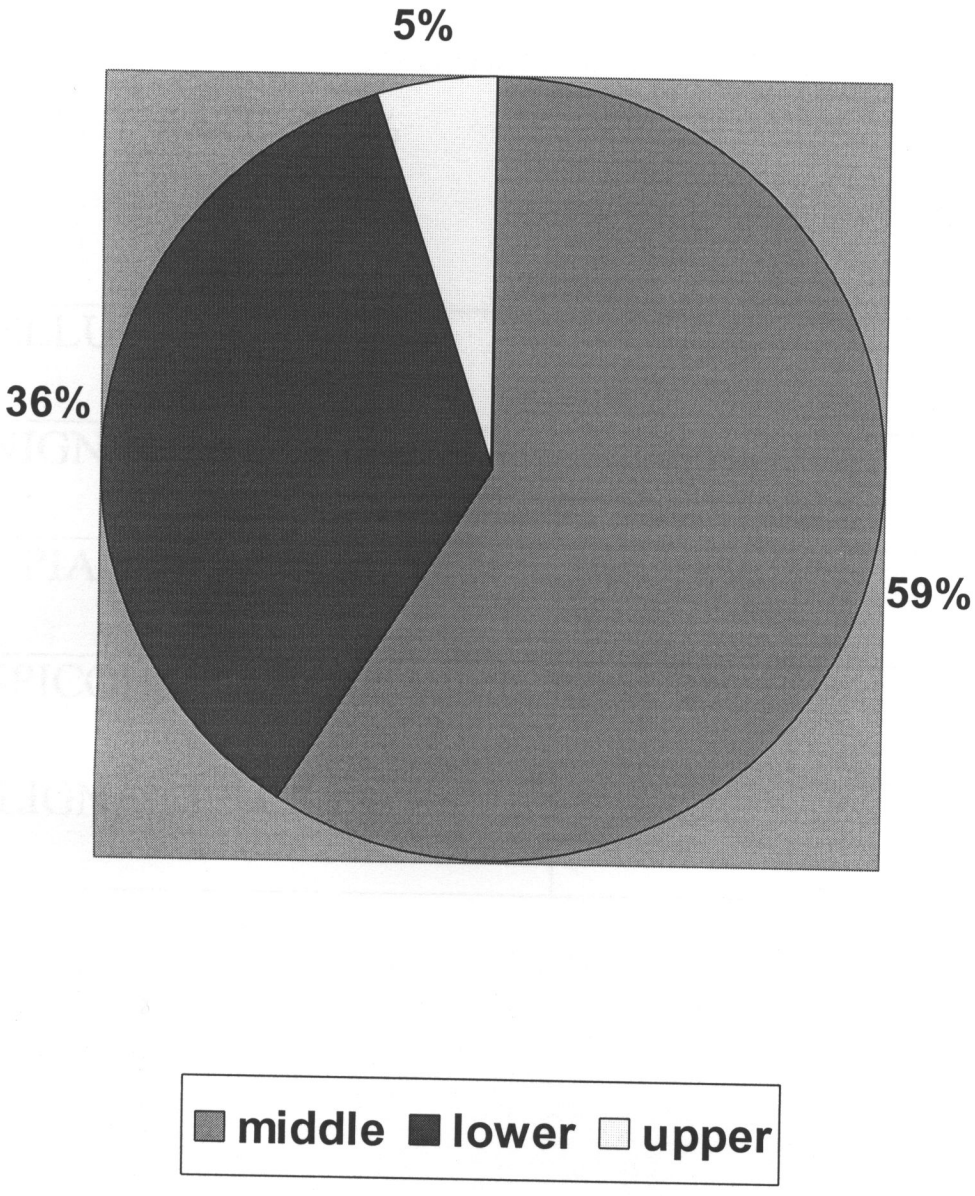


Figure 7

FNAC RESULTS

CONSENT RATE 100%

ACELLULAR C1	11%
BENIGN C2	63%
ATYPIA C3	14%
SUSPICOUS C4	4%
MALIGNANT C5	8%

Figure 8

HISTOLOGY TABLE

CONSENT RATE 100%

CARCINOMA	**31%**
FIBROADENOMA	**53%**
PAPILOMA	**3%**
INFLAMMATORY	**5%**
CYST	**5%**
CYSTIC DISEASE	**5%**

Figure 9

AGE AND HISTOLOGICAL DIAGNOSIS

	LESS THAN 25YRS	EQUAL / GREATER THAN 25YRS
MALIGNANT	10%	90%
BENIGN	80%	20%

MEAN AGE= 30.1YRS CANCER

MEAN AGE=24.3YRS BENIGN

Figure 10

SENSITIVITY AND SPECIFICITY

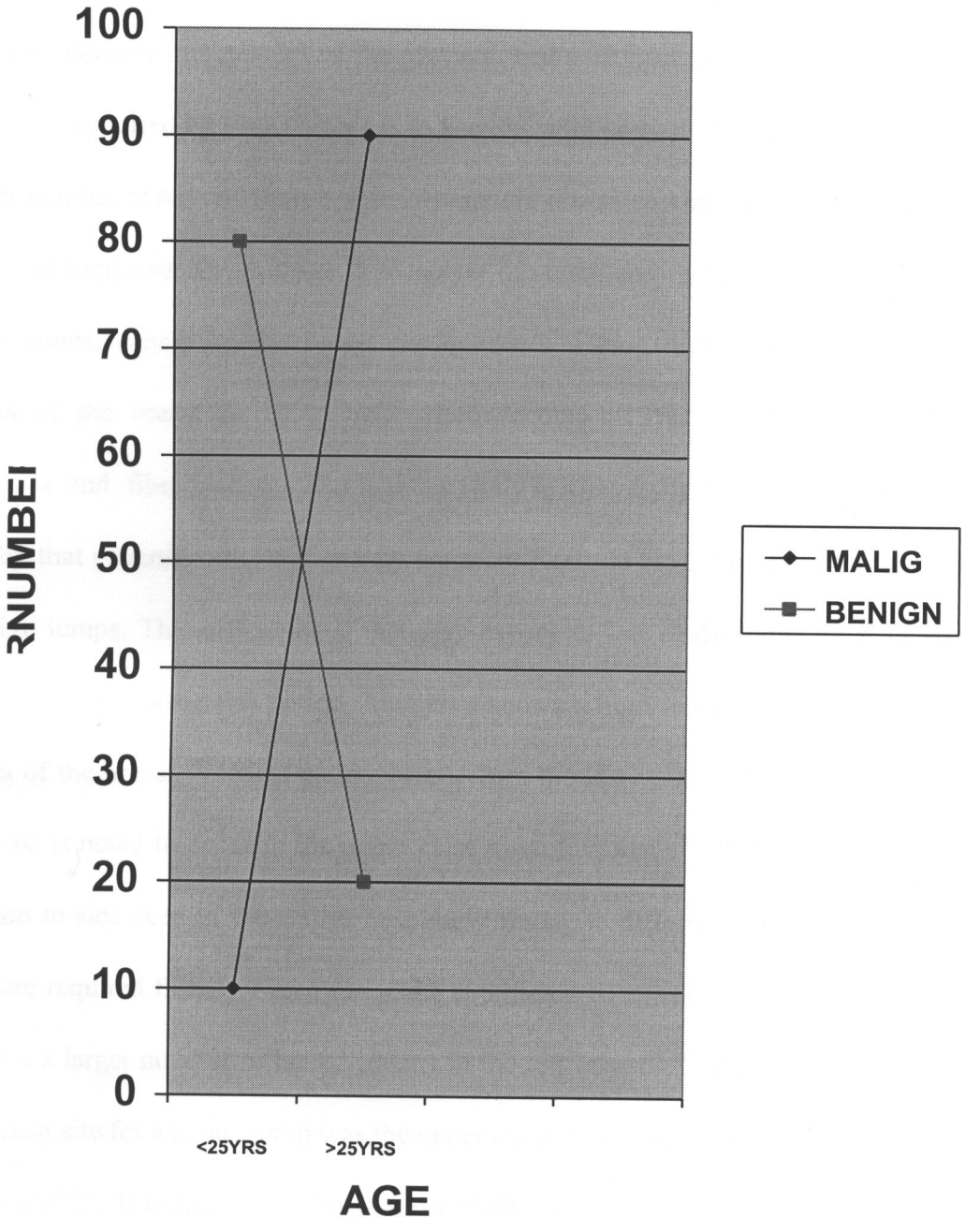
OF FINE NEEDLE ASPIRATION

	FNAC	HISTOLOGY
BENIGN	24	25
MALIGNANT	8	11

Sensitivity = 8/11 = 73% **Specificity= 24/25= 96%**

Figure 11

Age and Diagnosis



Discussion

Disease Pattern

The results show that 37% of all patients seen in this study with breast lumps were under 20 years of age. Seventy one percent of the patients had a clinical diagnosis of fibroadenoma subsequently supported by FNAC. This is in keeping with current literature which shows that the largest number of breast lumps below 20years are fibroadenomas. They compnse as much as 60% of all lumps seen at this age [26]. However literature shows, in most pathology studies of breast lumps, cancer of the breast predominates. Dixon and Mansel give figures of carcinoma of the breast as 26%, while fibroadenoma 13%.[27]. Phiri found 23.6% malignancies and fibroadenoma 22.5% in his study in University Teaching Hospital [1]. It is noteworthy that patients with malignancy are more likely to have a biopsy than are patients with benign lumps. This difference is therefore expected. The study found no male patients with breast lumps during this period. Literature shows a high female to male ratio 100:1 in carcinoma of the breast [21] . Most patients were from the low to middle social class. Cancer of the breast is noted to occur in the upper class more frequently[21]. There was no significant predilection to side seen in the study. This study found no difference of lesion side. Larger numbers are required from our study to make significant conclusions on this. Some workers have shown a larger number of breast lesions in the left breast[12],[21]. This study found that the most frequent site for a breast lump was the upper outer quadrant. Many workers have found similar results[12],[21]. It is stated that this is most likely the result of the large volume of breast tissue found at this site. The age range was narrow and did not go beyond 50years. Most of the patients seen were below 25 years. In the developed countries there is a double peak at 16-25 years for benign disease

and a second between 45 and 55years for malignant disease [27, 3]. The presentation of breast disease in Zambia and Africa is different from that in developed countries '. The age is lower for carcinoma and the disease runs an aggressive course [1]. Therefore mammography is very suitable as a diagnostic and screening method in these countries, where patients are often over 40 years [27]. In Zambia and Africa the situation is rather different, most patients presenting below 40years of age. The study found that most of the patients with malignancy were between 25 and 35years. Mammography at this age is difficult to interpret. FNAC is better suited for screening of breast lumps in Africa [1,6]. Fine Needle Aspiration is a simple technique which is easy to learn [2], has a wide patient acceptance [27]. Our study found there was 100% acceptance to FNAC compared to 49% consent rate for open biopsy. The study found that even where cytopathology services do not exist FNAC gives some value in augmenting clinical diagnosis. It was noted that in the needle feel and the nature of the aspirate predicted the FNAC result with up to 95% accuracy. This is supported by the findings of the NHSBSP team who state that the needle feel and appearance of the slide spread gives information about the nature of the lump [5].

Technique

The author who personally performed all the aspirations has had no previous experience in FNAC. Notwithstanding this the inadequacy rate (the number of slides that could not be reported due to insufficient sample) of 11% was well within the minimum requirement for quality assurance of <25% given by the NHSBSP team [5]. This reinforces the statement that although there is a learning curve , FNAC is a technique which is easy to learn. It is widely stated that FNAC is relatively inexpensive. The NHSBSP team summarises the issue by

stating that the cost of FNAC is one tenth of the cost of performing an open biopsy [5]. In Zambia the cost charged for biopsy hospital stay and operation is about $100. In contrast to this the total cost of FNAC is no more then $20. This involves a considerable saving especially if large volumes of biopsy work is being done, as in University Teaching Hospital [1].

Accuracy Testing

The sensitivity as defined by the NHSBSP team refers to the ability of FNAC to detect cancer in the lump. The specificity on the other hand refers to the ability to detect a lump as benign. Using this definition FNAC was 73% sensitive and 96% specific. In our study these tests were worked out separately for benign and malignant lumps. It was noted that FNAC was more sensitive in benign lumps but more specific in the malignant lumps. This means that the test was able to determine with greater certainty what was benign rather than what was malignant. Though the benign lesions had a higher false positive rate and therefore a lower predictive value then malignant lesions. There were no false positives for malignancy. Cytology is normally stated to have a false positive value of 0.2% in malignancy [31]. This is in keeping with the findings of this study. Some bias is expected due to the low numbers of the malignant lumps seen. It has been shown that breast lumps are easier to investigate in the older patients . The older the patient the more accurate both clinical examination and mammography tend to be [27].The NHSBSP gives guidelines for quality assurance in reporting of FNAC, they state that the minimum requirement for good FNAC , is a sensitivity of >60% and a specificity of >60% [5]. The present study meets this minimum requirements. Other workers in this field have produced similar results. In summarising over 12 studies and a total of 13,286 patients De Freitas found the sensitivity and specificity to range between 87%

Conclusion

1.Breast lumps are common in University Teaching Hospital. Most are benign and occur in women below *25* years. A few are seen above 25 years these are most frequently malignant and run a very aggressive course.

2.FNAC is a simple technique which is easy to learn and can be done on outpatient basis. It has good patient acceptance and has no notable complications.

3. FNAC in University Teaching Hospital is highly sensitive and highly specific. It meets the quality assurance criteria which have been recommended.

4. Recommendations for the use of FNAC in clinical practice in the University Teaching Hospital are given in the section that follows.

Recommendations

General

I .FNAC is a cost effective technique therefore guidelines for it's use should be produced.

2.Routine biopsy of breast lumps should be discouraged in patients below 25years.

3. A cytology service should be established in the University Teaching Hospital.

Technique

1.FNAC should be done on outpatient basis by one team of doctors. All patients should be referred to this team for FNAC.

2.One standard method of aspiration , staining and reporting should be used.

Uses

1. As a screening test for all breast lumps.

2. FNAC should be used in University Teaching Hospital as routine and the first line investigation for all breast lumps.

3.FNAC can be used as the main means of investigating clinically benign breast lumps.

Indications for Breast biopsy

1.Patients who are *25* years and below should have excisional biopsy only in the following circumstances;

a. The FNAC report is C4 or C5.

b. The lump is large (greater then 4cms).

2. All patients above 25 years must have biopsy, because of the high incidence of malignancy in this group. The purpose is to ensure the highest possible accuracy in the

treatment of these patients.

3. Impalpable breast lumps, lumps in women with pendulous breast and small lumps (less then 1cm) which give repeated acellular slides should have excisional biopsy.

References

1.Phiri Y. A retrospective study on the prevalence of Breast Carcinoma in the catchment area of the University Teaching Hospital. 1997 Research Thesis.

2.Lanin D.R, Silverman J.F, Walker C, Paries W,J . Cost Effectiveness of fine Needle biopsy of the Breast. *Annals of Surgery* 1996, **203**:474-80.

3.Haagensen C,D. Diseases oftheBreast 3rd edition , Philadelphia, W.B Saunders Company 1986.

4.Curling M. Fine Needle aspiration of Breast Lesions. *The Practitioner* 1985; **229**: 221-223

5.NHSBSP booklet. Guidelines for Cytology , London,The Royal College of Pathologists 1992.

6.Kodwavalva M,Y,D. The Third Rahima Dawood Memorial Lecture. *Proceedings of the Association of Surgeons of East and Central Africa.* 1991;**14**: 55-62.

7.Bem C, Patil P,S. Wide Needle Aspiration Cytology in the diagnosis of Lymphadenopathy in Zambia. *Journal of Clinical Pathology* 1990;**46**:806-9.

8.Arrian N, Anabasis of Alexander, New York , New York House 1942.

9.Ariel I,M, Cleary J,B . Breast Cancer Diagnosis and Treatment. Toronto. McGraw Hill Book Company, 1987.

10. Donegan W,L, Current Concepts: Evaluation of a palpable Breast Mass. *New England Journal of Medicine* 1992: **327**: 13

11. Surgery Audit, UNIVERSITY TEACHING HOSPITAL Dept of Surgery, 1996.

12.Foster M,E, Garrahan N,Williams S. Fibroadenoma of the Breast a clinical and pathological study. *Journal of the Royal College of Surgeons of Edinburgh* 1988; **33**:17-19.

13.Rogers K, Coup A,J, Surgical Pathology of the Breast. London, Butterworth and Company Limited, 1990.

14. Spence R,A, Watt P,C,H. Pathology for Surgeons, Bristol,.Wright, 1988.

15.Furnival C,M, Irwin J, R, M, Gray F,M. Breast Disease in young women when is biopsy indicated? *Medical Journal of Australia*, 1983;**2**:167-9.

16.Semb C , Pathological and clinical investigations of fibroadenoma. *Acta Scandinavia* 1928;**64** (Supplement 10):1

17.Block G,E and Zlatnik P,A. Giant Fibroadenoma of the Breast in a prepubertal girl. *Archives of Surgery* 1960;**80**:665.

18.Cooper A. Illustrations of the diseases of the Breast. London . ,Longrnan Green. 1982.

19. Reich T, Solomon C. Bilateral Cystasarcoma Phylliodes, malignant variant with 14 years follow up. *Annals of Surgery* 1983; **147**:39.

20.Ngala Kenda, JK. A case report of malignant Cystasarcoma Phylliodes. *Archives of Surgery* 1983; **118**: 871-72.

21.Mann C, V, Russell, R, C, G, Williams N, S. A Short practice of Surgery, 22nd edition, Chapman and Hall medical, 1995.

22. Chetty U. Benign Breast Disease. *The Practitioner* 1985;**224**:233-244

23.Heston J, F. Forty Five years of cancer in Connecticut. National Cancer Institute Monograph. 1935.

24. Patey D, H. The prognosis of Carcinoma of the Breast in relation the type of operation performed. *British Journal of Cancer*. 1948; **2**:7

25. Halsted S,W. The results of rational operations for cure of cancer of the Breast. *Annal of Surgery* 1907;**46**:1

26.Cuscheri, A, Giles ,G,R,R and Moosa , A, R. Essential Surgical Practice.2nd edition,

Boston,Wright Publications 1988: 836-858

27.Dixon J,M . ABC of Breast Diseases..BMJ publishing group, London, 1995.

28.Carpenter D. Kossoff G, Garrett W, J, Daniel K and Bode P. The octoscan a new class of ultrasound echoscope. *Australia Radiology* 1977;**27**:85-9

29.Parsons C. A. Diagnosis of Breast Disease. London, 1st Edition, Chapman and Hall. 1983

30.Hayashi N, Tamaki N, Yanekwa Y. Real time sonography of palpable breast masses.British *Journal of Radiology* 1985;**58**:611-5

31.Jones C ..H Methods of Breast Imagery. *Physics , Medicine and Biology*.1982;**27**,463-99.

32.Johannsson N.T, Bjurstam .N, Hedberg K, Hultburn A and Johnsen C .Thermography of the Breast. *Acta Chirugie Scandanivia* Supplement 1976, **460**.10-13.

33.Sickles E.A. Imaging Techniques other than mammography for the detection and diagnosis of Breast Cancer. *Research* 1990, **119**:127-35.

34.Lewis J,Milbrath J, Shaffer K, Darin J and Decosse J. Which Breast to biopsy? *American Journal of Surgery* 1976,**84:** 253-6.

35.Zajicek J. Diagnostic Cytology and it's histopathologic bases. 3rd edition. Philadelphia, Lippinicott Company 1979;29.

36.Schumann G, B, Colon V.F, The clinicians guide to diagnostic cytology .2nd edition. Chicago. Year Book Medical Publications inc. 1982.

37.Hadju S. Cytology from antiquity to Paopanicolaou. *Acta Cytologica* 1977:**21**:668

38.Koss L G. Diagnostic Cytology and its histopathologic bases. 3rd edition. Philadelphia, J B Lipponcott Co. 1977.

39.Deferietas R, Hamed H,Fentiman I. Fine Needle Aspiration Cytology of palpable Breast

lesions. British Journal of Clinical Pathology.1992.;**46**(3) :187-90.

40.Franzen S and Zajicek N. Aspiration biopsy in the diagnosis of palpable lesions of the breast. *Acta Radiologica*. 1968.**7**:241-260.

41. Frable J, W. Aspiration Biopsy of the Breast. *Cancer Trends*. 1982.**109**:452-5.

42.Hammond S, Keyhai-Rofagha S, O''Toole RV. Statistical analysis of FNAC of the breast. A review of 678 cases plus 4,265 cases from the literature. *Acta Cytologica* 1987;**31**:276-80.

43.Grant C, S, Goelinger J R, Welich J S, Martin J K. FNAC of the Breast . *Mayo Clinic Proceedings*. 1986.**61**:377-81.

44.Layfield L T, Glasgow B J, Cramer H.FNAC in the management of Breast Masses. *Pathology Annals* 1989.**24**:23-62.

45.Smith C, Buttler J, Cobb C, State D. FNAC aspiration cytology in the diagnosis of primary breast cancer. *Surgery* 1988.**103**:178-83.

46.Sheikh F A, Tinkoff G H,Kline T S,Neal H S.Final diagnosis by FNA biopsy for definitive operation in Breast Cancer. *American Journal of Surgery* 1987.**154**:470-4.

47.Abele J S, Muller T R, Goodson W H, Hunt T K and Holm D C.FNA of palpable masses. A program for staged implementation. *Archives of Surgery*.1983.**118**:7:859-64.

Appendix 1

PERSONAL DETAILS

Name..... Age..... Sex.....

Date of Birth..... Occupation.....

Address..... Number of Children.....

Martial Status.....

MEDICAL DETAILS

History

1.Symptoms.....

2.Duration.....

3.Family History of Breast Disease Yes/No

4. Contraceptive pill use Yes/No

EXAMINATION

1. Size of the Lump.....

2. Site /Side.....

3.Specific Features.....

4. Clinical Diagnosis.....

ASPIRATION DETAILS

1. Feel with needle.....

2.Aspirate (Colour/Volume).....

3.Number of Slides.....

Cytology Report

.....

.....

.....

.....

Histology Report

.....

.....

.....

.....

Appendix 2

C 1 Acellular Aspirate

Indicate a scanty or acellular specimen or poor preparation. The designation of an aspirate as "inadequate" is to a certain extent a subjective matter and may depend on the experience of the aspirator and /or interpreter.

Poor cellularity, (usually less than five clumps of epithelial cells) is sufficient to declare an aspirate inadequate. Preparative artifacts or excessive blood may also be reasons for rejecting an aspirate as inadequate.

Preparative artifacts include:

1. Crush, when too much pressure is used during smearing.
2. Drying, when the smears are allowed to dry too slowly (dry smear should be dried quickly, wafting in the air can speed up drying) or when when the wet fixed smears have been allowed to dry out before fixation.
3. Thickness of smear, when an overlay of blood , proteins rich fluid or cells is obscuring the picture, making assessment impossible.

It is often helpful to make a comment as to the cause of inadequate specimens in the comment box on the form.

C2 Benign

Indicates an adequate sample showing no signs of malignancy and if representative a negative report. The aspirate in this situation is poorly to moderately cellular and tends to

consist mainly of regular duct epithelial cells. These are generally arranged as monolayers and the cells have the characteristic benign cytology features. The background is usually composed of dispersed individual and paired naked nuclei. Should cystic structures be a component of the aspirated breast, then a mixture of foamy macrophages and regular apocrine cells may be part of the picture. Fragments of fibro fatty and or fatty are common findings. A positive diagnosis of specific conditions , for example: fibroadenoma, fat necrosis, granulomatous mastitis, lymph node etc, may be suggested if sufficient features are present to establish the diagnosis with confidence.

C3 Atypia probably benign

The aspirate here can have all the characteristics of a benign aspirate as described in the previous paragraph. There are however, in addition, certain features not commonly seen in benign aspirates.

These could be any , or a combination , of the following:

1. Nuclear pleomorphism
2. Some loss of cellular cohesiveness
3. Nuclear and cytoplasmic changes resulting from e.g hormonal (pregnancy, pill, HRT) or treatment influences . Increased cellularity may accompany the features.

C4 Suspicious of Malignancy

The pathologist's opinion is that the material is not diagnostic of malignancy. This may be for the following reasons:-

1. The specimen is scanty, poorly preserved or poorly prepared, but some cells with features of malignancy are present.

2. The sample may show some malignant features without overt malignant cells present. The degree of abnormality should be more severe than in previous category.

3. The sample has an overall benign pattern with large numbers of naked nuclei and or cohesive sheets of cells, but with occasional cells showing distinct malignant features.

C5 Malignant

Indicates an adequate sample containing cells characteristic of carcinoma or other malignancy. The interpreter should feel at ease in making such a diagnosis. Malignancy should not be diagnosed on the basis of a single criterion.

Appendix 3

Giemsa Technique

Principle

This is a slightly modified version of the original Giemsa technique, which will give good results for sections. It will be appreciated that most acidophil cells as well as eosinphils will be stained to a similar colour. To achieve a good colour balance, it is necessary to initially over stain with giemsa stain and then slightly over differentiate in a weak (0.2%) acetic acid until there is an overall pink cast to the cells.

Requirements

1. Giemsa Staining Solution

Mix 7.3g Giemsa dry stain in 500ml glycerol which is heated to 50 degrees with periodic mixing. Allow to cool and add 500ml methanol. Mix and filter.

2. 0.2% Aqueous Acetic Acid

Method

1. Fix the slides in alcohol for 5 minutes
2. Stain in 5ml Giemsa stock and 45ml ph 7.0 water for 1 hour
3. Differentiate in 0.2 % acetic acid.
4. Rinse in tap water.
5. Cover with cover slip using DPX

Results

Nuclei..... purple

Acidophils..... pink/red

Basophils..... blue

Eosinophils..... red/orange

THE END