International Journal of Scientific Research in Science and Technology
Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijsrst.com)
© 2021 | IJSRST | Volume 8 - Issue 1

Conventional Method of Cancer Diagnosis : Biopsy

*** S. A. Patil, N. R. Thakare**
Department of Engg. Physics, P. R. Pote College of Engineering and Management, Amravati , Maharashtra, India

ABSTRACT
Biopsy is the conventional cancer diagnostic technique. In this paper, some literature survey has been done and it is observed that the conventional method of cancer diagnostic has got some drawbacks and limitations. More research work in spectroscopic techniques can lead to improvised method to detect cancer.

I. INTRODUCTION

In middle ages Abu al-Qasim Khalaf ibn al-Abbas Al – Zahrawi, an Arab Physician, surgeon and pharmacist was first to describe and perform a needle biopsy of the thyroid.[1]

In modern era, the term biopsy was introduced into medical terminology in 1879 by Ernest Besnier. The first diagnostic biopsy was performed in 1875 in Russia by M.M. Rudnev. According to Zerbino D. D., it is possible to make out three stages in more than 100 year history of the method development: an occasional use of histological procedure involving living organs and tissues accessible for observation and study (approximately until the late 19th century); restricted application of biopsy (until the mid 20th century); present stage at which the method is widely adopted and its use is general and total not only in oncology but practically in all clinical specialties.[2]

The first renal biopsy, in the modern era was performed by Eugen Hann in Berlin in 1881. This was followed by Reginall Harison in Liverpool in 1896.The first open biopsy, in which a small piece of tissue was removed for microscopy and diagnostic purposes, was done by Norman B Gwyn in Toronto in 1923.

The word biopsy is taken from Greek words that mean, “to view life”. A biopsy is a medical test commonly performed by a surgeon or an interventional radiology involving sampling of cells or tissues for examination. It is the medical removal of tissue from a living subject to determine the presence or extent of a disease. The tissue is generally examined under a microscope by a pathologist and can be analyzed chemically.[3,4]

An incisional biopsy is a procedure in which a small area of tissue is taken to identify the composition of a lesion or abnormability. An excisional biopsy is more involved procedure where the entire abnormality or area of interest is removed. To further clarify this, there are four options for obtaining a tissue sample:

- In fine needle aspiration test, the smallest needle is used to simply remove cells from the abnormality.
- A core needle biopsy removes not only cells but also a small amount of the surround tissue.

- An incisional biopsy takes out even more surrounding tissue. It takes out some of the abnormality, but not all.
- An excisional biopsy generally removes the entire area in question.

If the lesion of interest is large an incisional biopsy may be performed where as if the abnormality is small an excisional biopsy may be performed. Also a core needle biopsy can be performed on most parts of the body.[5]

After the biopsy is performed the sample of tissue that is removed from the patient is sent to the pathology laboratory. A pathologist is a physician who specializes in diagnosing diseases, such as cancer by examining tissue under a microscope. When the histopathology laboratory receives the biopsy sample, the tissue is processed and an extremely thin slice of tissue is removed from the sample and attached to a glass slide. Any remaining tissue is saved for use in later studies, if required. The slide with the tissue attached is treated with dyes that stain the tissue, which allows the individual cells in the tissue to be seen more clearly. The slide is then given to the pathologist, who examines the tissue under a microscope, looking for any abnormal findings. The pathologist then prepares a report that lists any abnormal or important findings from the biopsy. This report is sent to the physician who originally performed the biopsy on the patient.

In short we can conclude that the process of biopsy is more time consuming process. The other drawbacks of biopsy are discussed below.

II. METHODS AND MATERIAL

Drawbacks of Biopsy:

According to Wang Ko-Pen, one of the major drawbacks of the transbronchial needle biopsy is its technical difficulty. It is very difficult to penetrate the bronchial wall with an 18 gauge needle even with the protruded 21 gauge inner needle functioning as a trocar. The recommended core biopsy techniques of repetitive partial withdraw of the 18 gauge needle in and out of the lesion under suction is even more cumbersome.[6]

According to Louise Tremblay, there is an unavoidable disadvantage of breast core biopsy. The disadvantage is that there can be risk of infection after the procedure. This medical procedure that breaks the skin provides an opportunity for bacteria, fungi or viruses to enter the body through the skin and colonize tissues within the breast. Another disadvantage of breast core biopsy is scaring at the biopsy site, corresponding to the needle injection sites. Insufficient tissue collection is also another disadvantage of breast biopsy. In some cases, a breast core biopsy may have the disadvantage of not allowing the doctor to collect sufficient breast lump tissue to make a diagnosis. Lumps that occur deep within the breast tissue may be difficult to access with a simple needle biopsy.[7]

According to Medical Health test team many problems also occur during prostrate biopsy also. The main problem which is identified is the risk of injury or bleeding from the gland. Many cases report infection or injury after the procedure which necessitates further treatment. The prostrate biopsy procedure collects many samples in order to reduce the chances of missing a tumor. However this does not rule out the possibility that the test will miss the cancer. Because of the small and scattered nature of prostate cancer tumors, it can be said that the test is not completely accurate at confirming or ruling out prostrate cancer.[8]

The study made by E.H. Smith says that the increasing use of fine needle biopsy of abdominal lesion is associated with an increase in serious complication. His updated questionnaire reveals five deaths after 16,381 biopsies (0.031%) . According to his study out of 33 deaths, 21 involved biopsies of liver lesions, six involved pancreatic biopsies of the 23 instances of

needle tract seeding, 10 occurred after biopsies of pancreatic malignancies.[9]

Dr. Luis A. Diaz's research reveals that in the terms of tissue acquisition, there are four major barriers that require real consideration. The first two relate to clinical topics, physician and patient opposition, and procedural toxicity. When samples are available from a cancer surgery, the availability of tissue is not an issue. However, biopsies as part of a clinical trial are complicated by physician and patient reluctance, especially since these biopsies will often not influence the outcome of the patient at hand. Biopsies are an inconvenience from a scheduling perspective, increase the cost of patient care, and are another uncomfortable, invasive procedure for patients. Furthermore, biopsies are not without complications.[10]

There are also technical barriers to tissue acquisition that require discussion: sample characteristics and tumor heterogeneity. Following a biopsy, the majority of tumor tissue is preserved in formalin-fixed paraffin-embedded blocks (FFPE), which crosslink DNA to the point that a large fraction of archived FFPE samples have been reported to be inadequate for molecular analysis, which is why freezing is the ideal choice for preserving tumor tissue. In each of these blocks of tumor tissue, the amount of tumor is dependent on the tumor cellularity (% tumor) and the size of the section of tumor. Some tumors have a high percentage of tumor cellularity (colon cancer, sarcomas, renal cell carcinomas) while other tumors have poor tumor cellularity because of necrotic tissue or stromal contamination (pancreatic cancer, glioblastoma). This is further compounded by low tissue amounts present from fine-needle aspirates and core needle biopsies, which provide a very small amount of tumor tissue for analysis in comparison to surgically respected tumors.

Tumor heterogeneity also proves to be problematic. Tumors themselves are heterogeneous, with different areas of the same tumor showing different genetic profiles (intratumoral heterogeneity); likewise, heterogeneity exists between metastases within the same patient (intermetastatic heterogeneity). A biopsy or tissue section from one part of a solitary tumor will miss the molecular intratumoral as well as intermetastatic heterogeneity. Taken together, the quality of the molecular information derived from any biopsy depends on how well the sample accounts for tumor cellularity, method of preservation, molecular and tissue heterogeneity, and quantity of tissue available for analysis.

III. RESULTS AND DISCUSSION

Drawbacks of histopathological method of cancer diagnosis:-

The optical treatment of patients with cancer depends on establishing accurate diagnosis by using a complex combination of clinical and histopathological data. According to Shridhar Ramaswamy and co-workers in some instances, this task is difficult or impossible because of atypical clinical presentation of histopathology. Also cancer classification relies on the subjective of both clinical and histopathological information with an eye toward placing tumors in currently accepted categories based on the tissue of origin of the tumor. However clinical information can be incomplete or misleading. In addition there is a wide spectrum in cancer morphology and many tumors are atypical or lack morphologic features that are useful for differential diagnosis.[11]

According to the Hiroshima Tumor Registration committee, which registers tumors that have been diagnosed by pathologists, the number of cases, registers registered has increased threefold for gastric and 20 fold for gastric adenoma over the past 20 years. This suggests that, recently many tumors have been biopsied or dissected endoscopically, while tumor tissues were collected only by surgery in earlier periods. The histopathological diagnosis is thus, extremely important for obtaining definitive and supportive diagnosis, diagnosis depends only on

histopathology has certain limitations. Many lesions have morphology which is in between that of benign and malignant lesions, and differential diagnosis is therefore difficult. Variation between pathologists may lead to changes in assessments of the lesion. Differences in diagnostic criteria such as those for early gastro intestinal cancer diagnosed by western and Japanese pathologists, lead to misunderstanding by clinicians. Furthermore information derived from morphologyis of limited use in determining the degree of malignancy and the patient's prognosis .No genetic information can be obtained in hereditary cancers.[12]

IV. CONCLUSION

Although biopsy is still carried out in medical practices for cancer diagnosis, the above literature survey suggests that this conventional technique has some disadvantages and limitations. Such as, this method may lead to complications like infection and bleeding. The lumps which are deep inside are difficult to undergo for biopsy. Spectroscopic techniques, such as Laser induced fluorescence is a powerful noninvasive method for tissue pathology recognition and monitoring. Also Raman Spectroscopic technique is a great tool to study the structure and dynamic functions of biological molecules. Extensive research is being carried out for monitoring and diagnosis of diseases such as precancerous and cancerous lesions in human soft tissues[13] .Further research in this domain can lead to more improvise cancer diagnostic technique.

V. REFERENCES

[1]. History of Renal Biopsy, Renal Med. (2014)

[2]. Zerbino D.D., (1994), "Biopsy: Its history, current and future outlook."

[3]. Anderson J. B., Webb A. J. (1987), "Fine-needle aspiration biopsy and the diagnosis of thyroid cancer", The British journal of surgery.

[4]. Saibeni S. , Rondonnotti E., Lozzelli A., Spina L., Tontini G. E., Cavallaro F., Ciscato C., De Franchis R., Sadanelli F., Vechi M., (2007), " Imaging of the small bowel in Crohn's Disease: A review of old and new techniques"

[5]. Taylor Whaley J., (29 Feb 2012), "Incisional and Excisional biopsy", The Abramson cancer center of the university of Pennsylvania.

[6]. Wang, Ko Pen M. D., (April 1994), "Transbronchial needle aspiration to obtain Histology specimen: Journal of Bronchology"

[7]. Tremlay L., (August 7,2010), "Disadvantages of Breast Core Biopsy"

[8]. Medical Health test team,(October 16,2012), " Prostrate Biopsy pros and cons"

[9]. Smith E. H. (1991), "Radiology: Complications of percutaneous abdominal fine needle biopsy", volume 178,issue 1

[10]. Dr. Luis Diaz,(April22 ,2013), "Tissue acquisition for personalized therapy: Merits and drawbacks".

[11]. Ramaswamy S.,Osteen R. T., Shulman L. N., (2001), "Clinical oncology", pp. 711-719

[12]. Wataru Yasui, Naohide Que, Hiroki Kuniyasu, Reiko Ito, Eiichi Tahare, Hiroshi Yokozaki, (2001), "The molecular diagnosis of gastric cancer present and future", Journal: Gastric cancer, Vol.4, issue 3, pp113-121

[13]. Tuan Vo-Dinh, Oak Ridge National Laboratory "Biomedical Photonics Handbook", CRC Press Washington DC, 2003