A Study on the Applications of Diagnostic Histopathology of Tumors

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Abstract— Histopathology is the study of medical science which deals with the disease that occurs due to the tissue. Diagnostic histopathology is a technique that helps the medical industries in various ways by identifying the diseases, exact place, exact stage, severity and so on. Apart from these, applications of diagnostic histopathology are used in clinical and medical industries in order to identify the advancements of treatments. This research discusses in detail about the histopathology and the applications of diagnostic histopathology of tumours.

Index Terms—Histopathology, Pathology applications of histopathology, and tissues

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INTRODUCTION TO HYBRIDOMA TECHNOLOGY

Histopathology is also called as the cellular pathology. Histopathology deals with the disease that relates to tissue. In other words, histopathology is the branch of medical science which is concerned with the diseases that occurs due to the changes in tissues. Histopathology is the microscopic examination of the tissue related diseases. In the clinical medicine, histopathology is the biopsy or surgical specimen by the pathologist and then it may be placed in fixative in order to prevent the tissues from the decay. The term "histopathology" is derived from Greek and it is a combination of 3 words. Histos means tissue, pathos means suffering or disease, and logos mean study. Thus, histopathology is the study of tissues which are caused due to any diseases.

Histopathology of the tissues starts with the biopsy, autopsy or surgery. The tissue will be removed from the plant or body and then it will be placed in particular place to prevent the decay. Histopathology is the study of tissue related diseases. The work of histopathologists' is to deal with biopsies, surgical resections and cytology samples. Apart from these, the final diagnosis of any patients is made by the histopathologist and it will be the important bearing on the clinical management.

Histopathology is often mentioned to evaluate lumps, masses, and other abnormal tissues that removed from the animals (Lillie, 1965). Pathology has ability to appreciate the mechanisms of disease at molecular, macroscopic, and microscopic level. Histopathologists may require good diagnostic skills and this is not only to identify the type of disease but also to identify the severity and extent of disease in order to provide appropriate treatment to the patients.

Histopathology is a study of microscopic abnormalities or changes in the tissues which are caused due to the result of diseases. Histopathology is examination of tissues under microscope from the body in order to identify the characteristics of disease. Apart from these, histopathology report explains about the tissue that examined under the microscope (Bancroft, and Stevens, 1990). Histopathology report is also known as the biopsy report. The doctor who is specialist to examine under the microscope is known as pathologist. The study of tissue will be from a surgery or a biopsy. The tissue can be removed from the diseased region of the body by doing the surgeon. Then, the layer will be cut into very thin layers known as the sections and then it is examined under the microscopes in order to characterize the details of cells that present in the tissue.

The following are the specimens for the tissue diagnosis:

- tissue embedding and processing
- frozen tissue sectioning
- paraffin sectioning
- immunohistochemical staining
- histochemical staining

- situ hybridization and
- histopathological diagnosis and report

The following figure illustrates the process of diagnostic histopathology.

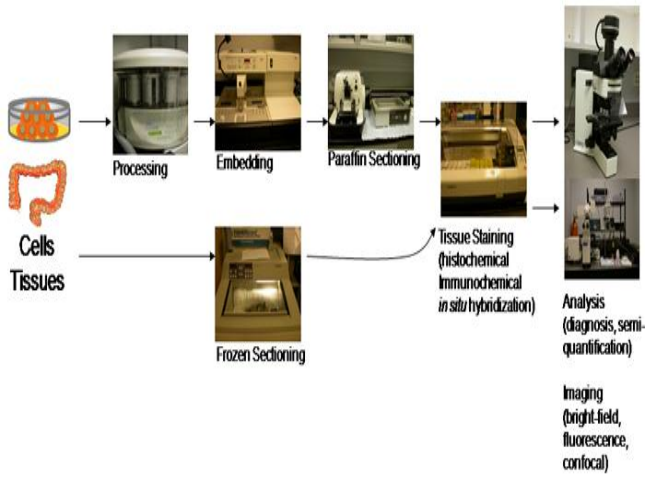

Figure: Process of Diagnostic Histopathology

Source: Shared Resources (nd) The Diagnostic and Molecular Histopathology Core, retrieved on 3rd April 2013 from http://web-shared.nccu.edu/cfusion-site001/wip2011/bbri2/diagnosticMolecular.cfm

The human tissue comes out from the surgery and two types of tissue will be obtained.

- Biopsy: Biopsy is a small piece of tumour or lesions which will be sent for diagnosis before the removal of the tumour or lesion (Incisional biopsy).
- If the entire tumour or lesions will be sent for the diagnosis and examination by the pathologist then it is known as the excisional biopsy.
- Tissues from autopsy can be sent for study of disease and also for identifying the advancement of medicine.

APPLICATIONS OF DIAGNOSTIC HISTOPATHOLOGY OF TUMORS

Various applications are using diagnostic histopathology in order to identify the disease related to biochemical, molecular and cellular processes. Diagnostic histopathology helps to identify the patient's disease and complications and also symptoms. Pathology is the one which covers all aspects of the diagnostic methods based on the laboratory techniques. Apart from these, it covers the methodologies in order to transmit the diagnostic data to other physicians directly with the patient treatments. Some of the applications of the diagnostic histopathology of tumors may include: ovarian cancer, gene expression profiling, head and neck tumors and leukemia and so on.

a) LEUKEMIA:

Leukemia is one of the types of cancer that occurs on the bone marrow or blood. This is characterized by the abnormal increase of immature WBC (white blood cells) known as blasts. Leukemia is a broad term that covers broader group of diseases that affecting bone marrow, lymphoid system and blood. These are all known as the hematological neoplasms. Leukemia is the treatable and controllable disease. Most treatments involved in leukemia are hormone treatments, medical radiation therapy or chemotherapy.

Pathologically and clinically, leukemia is subdivided into number of groups. At first leukemia is divided into two types: Acute and Chronic forms.

The following table illustrates the major types of leukemia.

Four major types of Leukemia

Cell type	Acute	Chronic
Lymphocytic leukemia (or "lymphoblastic")	ALL (Acute lymphoblastic Leukemia)	CLL (Chronic lymphocytic Leukemia)
Myelogenous leukemia (also "myeloid" or "nonlymphocytic")	AML (Acute Myelogenous leukemia) (or myeloblastic)	CML (Chronic Myelogenous leukemia)

Table: Types of Leukemia.

Source: Jameson, J. N. St C.; Dennis L. Kasper; Harrison, Tinsley Randolph; Braunwald, Eugene; Fauci, Anthony S.; Hauser, Stephen L; Longo, Dan L. (2005): *Harrison's principles of internal medicine*. New York: McGraw-Hill Medical Publishing Division.

Acute leukemia: Acute leukemia is a process that is characterized due to the rapid increase of immature blood cells. Children are the common forms who are mostly affected by acute leukemia.

Chronic leukemia: Chronic leukemia is characterized and this is due to abnormal white blood cells. Chronic leukemia is the once which is mostly occurs to older people.

Here, histopathology is used to identify and diagnosis the several stages of leukemia. Apart from these, histopathology is used to identify the stage of leukemia and also about severity and extent of leukemia in order to provide appropriate treatment to the patients.

b) GENE EXPRESSION PROFILING:

Gene expression profiling may have capacity to replace histopathological examination of the tissue sample. Histopathology is inexpensive and also highly effective in its behaviour and response to the therapy. The finite amount of information that available in the histological section of tumour creates the opportunity for using gene expression profiling in order to diagnostic and to improve the diagnostic sub-classification of the tumors. While in the case of lymphomas, it is important to identify the molecular diagnostics, IHC, cytogenetics, and flow cytometry in order to improve the diagnostic accuracy over the light microscopy.

The significance of identifying the sub-classifications of the existing tumour types lies in the previously unrecognized subsets of the tumors that provide increased response to certain therapies. Here, Gene expression profiling will able to provide the significant molecular sub-classification of gliomas (Nutt et al, 2003), breast carcinomas (West et al, 2001; Sorlie et al, 2001), lung carcinomas (Garber et al, 2001), medulloblastomas and lymphomas (Alizadeh et al, 2000; Rosenwald et al, 2003) based on the conventional histopathological examination. Gene expression profiling is mainly used to identify the new markers which have capacity to predict the response in order to targeted therapy.

c) OVARIAN CANCER:

Ovarian cancer is the cancer that occurs in the ovary. Symptoms may include: pelvic pain, bloating, frequent urination, and difficulty in eating. Other findings may include back pain, tiredness, abdominal mass, constipation, abnormal weight loss, and vaginal bleeding. Diagnosis of ovarian cancer may starts with the procedure of physical examination which include blood test, pelvic examination, and transvaginal ultrasound. Histopathology is used to identify and diagnosis the stages of ovarian cancer and also helps to identify the complexity in the treatment.

d) HEAD AND NECK CANCERS:

Head and neck cancers usually start with the squamous cells from the moist and mucosal surfaces (inside the nose, mouth and throat). Apart from these, this type of cancer may also start from salivary glands. Use of alcohol, tobacco and human papillomavirus infection are the risk factors of the head and neck cancers. The following are the regions of head and neck cancer.

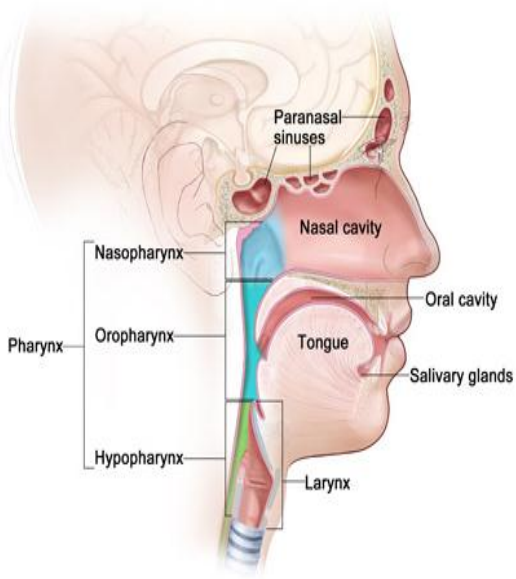

Figure: Regions of Head and Neck cancer

Source: National Cancer Institute (2013): Head and Neck Cancers, retrieved on 3rd April 2013 from

http://www.cancer.gov/cancertopics/factsheet/Sites-Types/head-and-neck

Diagnostic histopathology is used to identify the type of cancer along with the treatment plan for the individual patient based on the stage of the cancer, exact location of the tumour, and about person's general health. Apart from these, the treatment for head and neck cancer may include: radiation therapy, targeted therapy, surgery, chemotherapy, or combination of treatments.

e) TUMORS OF THE SKIN:

Skin cancers are the type of cancer that occurs on the skin cell. Basal cell cancer is the one that starts from the

epidermis which is the lowest layer and it is most common and dangerous skin cancer. Melanoma cancer starts from the pigment producing cells called as melanocytes and it is rare and also most aggressive and also it spreads quickly and it become fatal when it is untreated. Squamous cell cancer starts from the middle layer of the skin and it is less common and it has capacity to spread over and it become fatal when it is untreated.

Characteristics of the skin tumour may identified by: tumour width, histological subtype, tumour differentiation, excision margins, Clark level, perineural and angio-invasive growth, inflammation, Breslow depth, ulceration and desmoplasia. Petter, Haustein and Breuniger (1997) identified that ulceration, desmoplasia, blood vessel invasion, clark level, tumour-associated tissue eosinophilia, Breslow depth, lymphatic invasion and tumour size are largely related to the metastasis.

The skin cancer may have different symptoms. These may include changes in the skin, discolored skin, enlargement of the mole, changes in existing mole and ulcering the skin. These symptoms may vary from person to person. Histopathology helps to identify the type of tumor that occurs in the skin. Generally, Basal cell cancer may symptoms like smooth, pearly bump, raised on sun exposed skin of sholders, neck and head. Squamous cell cancer may provide symptoms like scaling, red and thickened patch on sun-exposed skin. Melanoma cancer is identified by histopathology by change in shape, size and color in the pigmented lesion with pain or itching. Apart from these, histopathology has capacity to identify the tissues which are affected due to the diseases.

Apart from these, the applications of the diagnostic histopathology of tumors may include: tumors of the heart and pericardium, tumors of the lung and pleura, Salivary Gland Tumors, tumors of the Liver, Tumors of the Urinary Tract, Tumors of the Oral Cavity, Tumors of the Pituitary Gland, Tumors of the Breast, Tumors of the Skin, Tumors of the Ear, and Soft Tissue Tumors and so on. Diagnostic histopathology plays a main role in identifying all the tumors and also helpful to know about the severity of diseases in stage by stage.

CONCLUSION

This study concludes that, histopathology is the one which plays a main role in order to deal with disease that relates to tissue. Tumors are the disease which causes more death every year around the world. Histopathology is the branch of medical science which helps to identify the diseases, symptoms, severity of the diseases and the right treatment for the identified diseases. There are several applications which use diagnostic histopathology in order to obtain various benefits. This research concludes that diagnostic histopathology is playing a main role in the clinical and medical laboratory.

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