

## The changing role of the pathologist

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Since its recognition as a medical specialty several centuries ago, pathology has championed the scientific study and practice of medicine. It was founded on a technological base, advances in which have led, inevitably, to changes in the structure and practice of the specialty itself over the years. These changes have generated certain misconceptions about the specialty, which this paper has sought to outline. The paper also discusses the role of the pathologist

(laboratory physician) in the medical team, his contribution to the practice of modern scientific medicine, and future direction of the specialty.

*Key words:* pathologist, specialty, histopathology, chemical pathology, hematology, microbiology

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### Introduction

From the days of Hippocrates, the practice of medicine has emphasized the art rather than science. Thus, major disciplines of Internal Medicine and Surgery became easily recognized and established early, the latter benefiting from contributions from Arabic influence. Research in medicine started much later in the Medieval Ages and was in the hands of wealthy amateurs.<sup>1</sup> The scientific basis of medicine became recognized only following the abandoning of the 'theory of spontaneous generation' and the adoption of the 'theory of contagion'. The discovery of causes of infection as well as observation of tissue changes in disease states that followed the discovery of the microscope, set the stage for recognition of pathology as a specialty, which culminated in the establishment of the first school of pathological anatomy in Paris under Jean Cruveillier.<sup>1</sup>

Whereas pathological anatomy started with dissection of the human body and description of gross morphological alterations in various organs in disease states, by the time pathology became a recognized specialty, microscopical examination of tissue and cellular changes had become established. Today, the techniques available to the pathologist for investigating disease processes have moved be-

yond morphology into the realms of molecular biology. Thus, pathology as a specialty, has evolved very rapidly over the past two centuries. In the process, it has offered a medium for scientific study of disease, becoming the bridge that spans the apparently growing gulf between the fashionable art of the practice of clinical medicine and surgery and the rapidly advancing basic sciences. The purpose of this communication is to highlight the changing landscape of pathology and the resultant misconceptions that have arisen as a result of the changes the specialty has undergone over the centuries.

### Misconceptions about Pathology (Laboratory Medicine)

The pivotal role of pathology outlined above, has generated a few misconceptions that must be addressed: Firstly, in the early stages of its establishment the autopsy formed the bedrock of the practice of pathology, leading other clinical colleagues to view the specialty as an institution of 'inquisitors', with the basic aim to unearth and publicize mistakes of clinical colleagues through the autopsy. This misconception has tended to mislead both medical colleagues and non-medical people alike and detract from the invaluable audit and educational functions of the autopsy. The decline in hospital autopsies over the past few decades may be viewed against the background of this misconception. Secondly, early pathologists have over-emphasized the labo-

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ratory aspect of their practice, sometimes to the neglect of their clinical roles. This tendency led Dyke<sup>2</sup> in the 1930s, to observe that "the pathological laboratory (which is) not in intimate contact with a hospital and the pathologist without close continuing ward experience, efficient as their work may be in other branches of the subject, cannot do really satisfactory work in clinical pathology". Thirdly, rapid advances in biotechnology have placed at the disposal of pathologists and laboratory scientists, a formidable array of scientific equipment and gadgetry which non-laboratory personnel often find intimidating. Furthermore, data churned out from the laboratory can be confusing to most clinicians, who may thus, fail to fully appreciate their immediate clinical relevance. Fourthly, the availability of highly trained laboratory scientists with the relevant expertise in assuming responsibility for equipment and methodology in the medical laboratories has left the laboratory physician (pathologist) buried within a mass of personnel and equipment, such that, some clinical colleagues may forget, or have become unaware of the existence of a clinical colleague in the laboratory, with whom investigative and management strategies are best discussed. This may explain, to some extent, the perennial problem of inadequately completed request forms and/or refusal of some clinicians to discuss cases with the pathologist. Over three decades ago, in the early years of my career as a pathologist, I was handed a quote purported to have been written by none other than George Bernard Shaw, which read as follows:

"sending a specimen to the pathologist without clinical information is a subtle tribute to his omniscience, but diagnostically worthless".<sup>3</sup>

The above statement is still relevant today, and not a credit to the relationship between the 'clinician' and the pathologist. Fifthly, while it is not difficult to appreciate the role of the histopathologist and cytopathologist in the laboratory, because reports are directly generated by them, some clinical doctors fail to appreciate the important role of laboratory physicians or pathologists in other areas of clinical pathology, namely, hematology, clinical chemistry and microbiology; their role in the planning of relevant investigations as well as interpretation of results, especially

where essential internal quality control measures have been instituted by the pathologist, and may have a direct bearing on interpretation of the results.

It is my opinion that these misconceptions must be brought out into the open for discussion, so that the need for closer consultation among all members of the medical team can be adequately addressed. Gone are the days when most diagnoses were based solely on patient's history and physical examination. The place of pathology has become firmly established and the specialty has, over the centuries proved itself beyond any doubt. Laboratory and imaging procedures together form an integral part of clinical medical practice. They are essential for diagnosis of disease, without which therapy cannot be instituted. Inherent in the procedures used by pathologists is the quest for more knowledge and a better understanding of the mechanisms underlying various disease processes.

## Attributes of the Pathologist

### WHO, THEN, IS A PATHOLOGIST?

Dyke<sup>2</sup> has described the pathologist as "a physician using somewhat different methods of observation – a microscope rather than the stethoscope, the results of chemical and bacteriological investigations rather than the unaided senses". Lambird<sup>4</sup> has extended this definition of the roles of the pathologist to include: 1) interpretation of visual and/or numerical laboratory data, largely derived from *in vitro* studies, for the diagnosis and management of patients; 2) management of the capital and people in the production of the data and, 3) serving as a quality and investigational resource for medicine through formal education and other quality assurance activities. Thus, McLendon<sup>5</sup> has aptly described the pathologist as: **a physician**, concerned with human suffering and willing to make considerable efforts to decrease this suffering; **a scientist** with an inquiring mind, using advanced tools available to study disease; **an educator** sharing his knowledge, methods of scientific inquiry and spirit with his students and other medical colleagues and, **a leader** of both pathology and medicine, because he believes in quality assurance and the role of pathology in the general advancement of medicine. These were attributes ascribed to pa-

thologists in the past and which still apply to the pathologist today.

The knowledge and skills required by the pathologist to fulfill his role as the physician directly concerned with transferring basic scientific findings into clinical context are considerable. Hence, formal training schemes in pathology generally, require longer periods than most other medical specialties. The aim of such training is to prepare the successful candidate to become a Specialist in pathology with the ability to assume a Consultant status in the shortest possible time after completion of training. Thus, in all branches of Pathology, greater emphasis is placed on Higher Specialist Training.

### Contributions of Pathology

Since its establishment as a specialty, pathology has contributed immensely to the rapid advances in medicine in general. Through morphological studies (the autopsy, histology and cytology), pathology has contributed to the classification of disease into the major categories we recognize today. Further subclassification of disease has been spearheaded by the specialty of pathology, even as newer methods for the study of disease have become available. Other subspecialties of pathology have contributed to this effort through defining the etiology of various diseases, or the biochemical and hematological lesions underlying the disease processes. Combining pathology with physiology has enabled the definition of functional aspects of disease processes in the field recognized as pathophysiology. In this way, the pathogenesis of most diseases has been worked out in order to explain the clinical manifestations of the diseases. With better understanding of disease processes have come bolder interventional methods in clinical practice. Effects of these interventions, including radiotherapy, hormone therapy and various other forms of chemotherapy, have been studied by the pathologist, in order to monitor response to therapy or progression of disease. Even as newer areas, such as, gene therapy are being studied, pathologists are actively exploring the feasibility of the exercise and the effect such modifications will have on the body.

By its very nature, the practice of pathology results in data generation, making the spe-

cialty eminently suitable for audit. A direct and important offshoot of this is the generation of data for research. Since its early days, research has been an integral part of the practice of pathology, regardless of the subspecialty. It is no coincidence, therefore, that centers of medical excellence, especially in western, developed countries have large, thriving, well funded and actively productive pathology departments or institutes. Examples are: The Armed Forces Institute of Pathology, Mayo Clinic in the USA, The Imperial Medical College in London, The Institute of Pathology of Berlin, to name a few. These departments/institutes have spearheaded advances in diagnostic techniques, protocols for management and research into the causation and pathogenesis of known as well as newer and emerging diseases. I have observed that medical institutions that have neglected the development of pathology have generally, not developed beyond delivery of general service. There is thus, some truth in the statement by Connors<sup>6</sup> that: "medical institutions that suppress or do not encourage the activities of pathology and pathologists are doomed to stagnation and are reduced to service institutions only... the pathologist who fails to exert his leadership role is also likely to condemn his institution to the same fate".

I have been witness to debates about whether a pathologist should be considered a clinician. Such debates do not serve the interest of the patient. Like all physicians, the pathologist must take full responsibility for his patients through the reports generated by him or from his laboratory. In many subspecialties of pathology, he may also be involved in direct patient care through holding clinics, admission of patients and in-patient care. Pennington<sup>7</sup> has advocated that: "the pathologist must undertake more direct patient care in specialized aspects of investigation and treatment". Thus, pathologists have taken full charge of infectious, metabolic, nutritional, hematological, immunological and other specialized areas of direct medical care of patients, including clinical management of these disorders. Similarly, histo/cytopathologists run fine needle aspiration (FNA) clinics for the management of various conditions. To serve these changing needs, training programs for the various subspecialties of pathology are constantly being reviewed and modi-

fied. These modifications are undertaken by training and certifying bodies, such as The American College of Pathologists, The Royal College of Pathologists of U.K. and similar other bodies worldwide.

The entire landscape of medical practice is changing and traditional divisions and barriers are beginning to fall. Perhaps, it is time to take a more holistic view of the practice of medicine, in order to appreciate more, the inter-dependence of the various traditional divisions. In the practice of modern medicine, attempts to retain or perpetuate traditional divisions will continue to send wrong messages to medical students and, indeed, the general public. Already, the traditional division of pathology into various specialties is being undermined by advances in molecular biology. Nucleic acid based techniques such as polymerase chain reaction (PCR) are now common to several pathology subspecialties and can be applied to the detection of microorganisms, notably Mycobacteria, as well as diagnosis of various other disorders. *In situ* hybridization (ISH) techniques and reverse transcriptase-PCR (RT-PCR) are being employed to determine expression of certain genes in various disorders. Known techniques such as interphase cytogenetics have been refined into fluorescent in-situ hybridization (FISH) methods which are more accurate in diagnosing genetic disorders as well as genetic alterations in various malignancies. Recombinant DNA and the microarray techniques are currently available for genetic diagnosis of some diseases. Various diagnostic kits have evolved from such advances resulting in simplification of many pathological techniques. Though originating in the basic sciences in the form of research tools, these are now within the realm of pathology and some are even available to the practicing pathologist.

### **Future direction of Pathology**

Research must remain the lifeline of pathology and the need for research training in pathology has been emphasized by many eminent medical scientists, notably Harris<sup>8</sup> and Grisham.<sup>9</sup> Like all specialties of medicine, Laboratory Medicine and the Laboratory Physician or Pathologist must continue to adapt to current technological changes. These must be reflected in the training of pathologists

and their ability to adapt to newer equipment and facilities. Essential to this adaptation will be their ability to justify increasing financial support and also satisfy the multiplicity of forces which drive investigators. Various Pathology organizations will need to be strengthened, to support the survival and growth of the specialty. In particular, accreditation as well as training or certifying bodies will need to strengthen their representation on governmental bodies to ensure full participation in national and international medical programs. The specialty and pathologists themselves must be prepared for the move back to the wards. This move has been predicted by Pennington<sup>7</sup>, who is of the opinion that it would mean a resurgence of side room diagnostic tests or 'bedside pathology'. While this prediction may hold true for some subspecialties of pathology (Clinical chemistry, Hematology and Microbiology), it is unlikely to be realized in the immediate future in others, like Histopathology, because of the very nature of the procedures used in this subspecialty.

Already, the impact of molecular pathology on the practice of pathology is considerable. There is also evidence that targeting genes and their alterations for the purposes of diagnosis can be extended to gene therapy. Attempts have been made to target defective genes, with the view to repairing them or replacing them with normal ones. This is the new and developing area of gene therapy, which also holds promise for the development of vaccines through recombinant gene technology.

Man's interaction with, and effect on his environment, has led to a growing range of emerging diseases. This phenomenon is more noticeable in infectious diseases, such as HIV, EBOLA and other viral infections, hence the active involvement of microbiologists in the diagnosis and management of these newer diseases. However, other specialties of pathology are not exempt. Thus, growth in the aviation industry and space exploration has added new dimensions to our understanding of chemical pathology of subjects exposed to such environments, while hematological changes related to air and space travel are being unraveled. Exposure to temperature changes, ionizing radiation, changes in atmospheric pressure and chemicals in the en-

vironment, all produce changes in the body; their significance in the causation of disease is still under study, especially their relevance to carcinogenesis. As a backbone to all these is the need for tissue diagnosis of many of the resulting disease processes, the traditional role of the histopathologist.

### Concluding remarks

The pathologist remains very much part of the clinical medical team. His unique role in applying basic scientific findings to the diagnosis and management of patients makes him a valuable asset to any medical team. Using the analogy of a tree; the branches, leaves, flowers and fruit (clinical sciences) cannot grow without nourishment channeled through the stem (pathology). Equally, the roots (basic sciences) cannot transmit nourishment from the soil direct to the branches of the tree in the absence of the stem. Thus, the pre-eminent position of the pathologist in the medical team does not change, but his individual role may undergo modifications dictated by changes in medical practice occasioned by man's ability to alter his environment and his capacity for technological advancement. The secret to survival in such circumstances is adaptation.

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