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PATHOLOGY MATTERS

Bringing you the latest news in clinical testing

Digital Pathology Reporting of Transrectal Ultrasound (TRUS) Biopsies of Prostate

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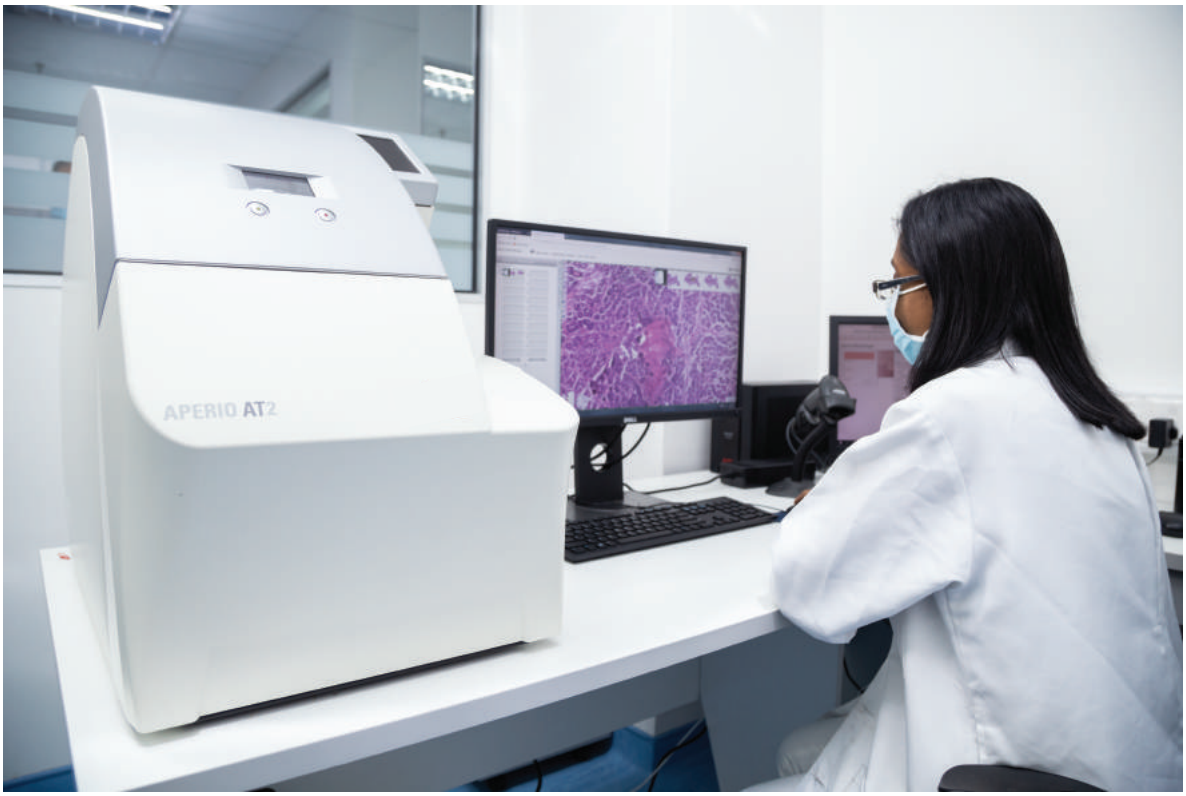
Digital pathology is an integrated component of primary reporting in Innoquest Pathology, Malaysia for the past two years. A highly advanced Aperio AT2 slide scanner (Leica Biosystems), which has been approved by FDA for primary reporting, is in usage for routine digital pathology reporting.



Many of the transrectal ultrasound (TRUS) biopsies were reported digitally, away from the office. A total number of 119 TRUS biopsy cases, many of which had a minimum of 12 cores were reported, digitally. Many cases also had targeted biopsies with MRI mapping for precision and accuracy. Reporting was done for individual core biopsies as per latest international guidelines.

Digital pathology reporting of TRUS biopsies is as accurate as conventional microscope reporting, and in many instances, more advantageous. With an integrated Dragon Speech software, all cases were reported with ease, without resorting to the conventional microscope for a review.

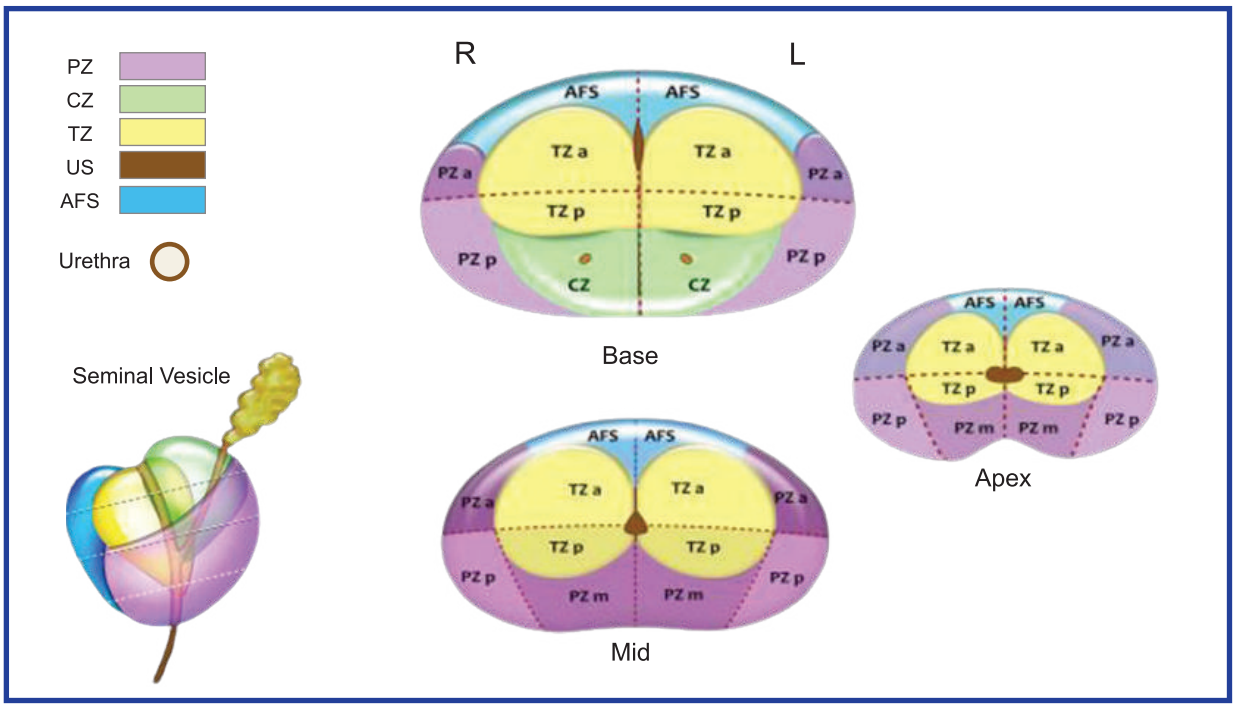


Figure 1: Section map dividing the prostate into different sectors and zones[1,2].
Anterior Fibromuscular Stroma (AFS), Central Zone (CZ), Transition Zone (TZ), Peripheral Zone (PZ), Urethral Sphincter (US).

Measurement of percentage of small malignant foci, and interpretation of Gleason pattern, coupled with digital photography has made the system more rewarding. Constant and perpetual practice has made digital reporting more dependable, robust, and accurate than conventional microscope reporting. IHC analysis with comparison of various IHC markers in a single view is a prolific outcome of digital reporting.

The response and acceptance from the Urologists have been overwhelming. Digital pathology reporting of TRUS biopsies of prostate is simple, dependable, accurate and should become a regular primary reporting procedure, where digital pathology is available. The accuracy and effectiveness are very advantageous for the current demand of uropathology in many laboratories.

This is the norm of future diagnostic digital pathology and artificial intelligence (AI).

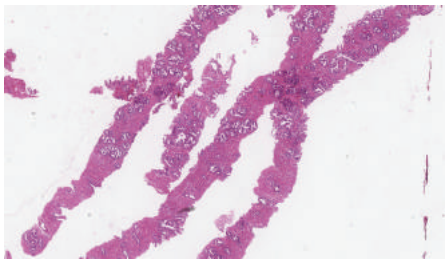


Figure 2a):
2x magnification view of core biopsies

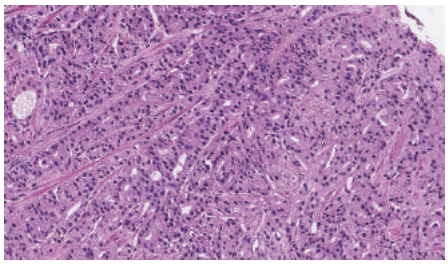


Figure 2b):
20x magnification of high-grade prostatic adenocarcinoma

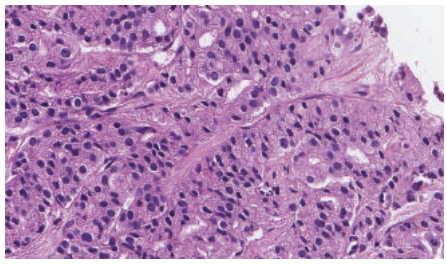


Figure 2c):
40x magnification of high-grade prostatic adenocarcinoma

References:

1. Demirel HC, Davis JW. Multiparametric magnetic resonance imaging: Overview of the technique, clinical applications in prostate biopsy and future directions. Turk J Urol. 2018 Mar;44(2):93-102.
2. Section map dividing the prostate into different sectors and zones. Image from pi-rads version 2. Adapted from https://benthamopen.com/FULLTEXT/TOAIJ-6-1/FIGURE/F1/

Advantage of Using Artificial Intelligence (AI) and Neural Network-Based Liver Test: A Non-Invasive Assessment of Liver Fibrosis, Inflammation, and Steatosis

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Global Cause and Prevalence of Liver Disease

Chronic liver diseases (CLDs), such as non-alcoholic fatty liver diseases (NAFLD) and non-alcoholic steatohepatitis (NASH) and chronic viral hepatitis, are leading causes of morbidity and mortality globally and usually develops over many years. NAFLD has increased in recent years (15% in 2005 to 25% in 2010)[1]. The disease is projected to increase significantly in multiple world regions by 2030 if current trends are left unchecked[2]. An approximate 20% of NAFLD cases develop NASH, the associated increase in NASH during the same period is to be expected (33% in 2005 to 59.1% in 2010)[1]. Numerous clinical practice guidelines including AASLD, EASL-EASD-EASO, APASL, and WHO recommend non-invasive biomarker-based diagnostic modalities to diagnose liver diseases.

Diagnosis and Staging of Liver Disease

A challenging element of the diagnostic workup of patients with NAFLD is the determination of disease severity. The goal is to identify patients with more advanced diseases at increased risk for morbidity and mortality.

Percutaneous liver biopsy, despite its invasiveness, and inter/intra-observer variability issues, remains the gold standard for making a precise diagnosis of NAFLD with specification categorization and is necessary to assess the histopathologic criteria essential to making a diagnosis of NASH[3,4]. Biopsy allows for confirmation of steatosis as well as determining the degree of lobular inflammation, ballooning, and fibrosis.

NASH is diagnosed based on an overall assessment by a pathologist using scoring systems such as the Steatosis, Activity, and Fibrosis (SAF) score, which evaluates for the presence and extent of each individual component of steatosis, inflammation, and ballooning[5] .

Utilizing AI with Neural Network Technology for Blood-based Test for Liver Disease

Artificial Intelligence (AI) using neural network tests are non-invasive clinical and staging tools for staging and grading steatotic liver disease that utilizes a combination of basic blood biomarkers and algorithm technology to generate a report for physician's use and it has been developed as an alternative to liver biopsy[3,6-8]. It is a reliable, and reproducible tool which provides grading or staging of the three liver lesions: fibrosis, activity, and steatosis[6].

Biomarkers and Anthropometrics

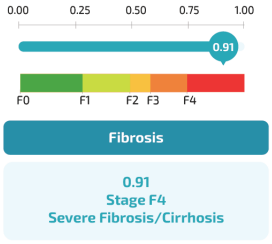
To generate the Fibrosis, Activity, and Steatosis scores, the AI and neural network-based software analyzes the results of 10 biomarkers and in combination with patient characteristics. The required serum biomarkers are:

- Alpha-2-Macroglobulin
- Apolipoprotein A1
- Haptoglobin
- Total Bilirubin
- GGT
- AST
- ALT
- Total Cholesterol
- Triglycerides
- Fasting Glucose

The individual serum biomarkers have been identified as appropriate biomarkers for liver disease evaluation[9-13]. Each serum biomarker results from FDA cleared assays, in addition to patient's age, gender, height and weight, are used in the neural network algorithm for scoring the three liver histological features.

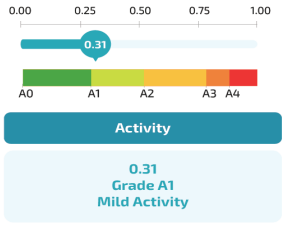
Staging and Scoring Interpretations

1. Fibrosis score to detect the degree of fibrosis. The result is provided as a score from 0 to 1, proportional to the severity of the fibrosis, with a conversion to the SAF scoring system (from F0 to F4). The five scores of histological scoring system are: F0 (no fibrosis), F1 (minimal fibrosis), F2 (moderate fibrosis), F3 (significant fibrosis), and F4 (severe fibrosis /cirrhosis). Fibrosis score has been validated against liver-related outcomes, including mortality with a high predictive value for liver related morbidities and mortality and for the overall mortality, similar to vibration-controlled transient elastography.

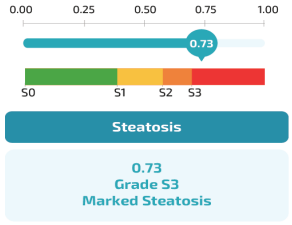


Staging and Scoring Interpretations (cont'd)

2. Activity score to detect the degree of ballooning and lobular inflammation. The result is provided as a score of 0 to 1, proportional to the significance of the activity, with a conversion to the SAF scoring system (from A0 to A4). The five scores of histological scoring system are: A0 (no activity), A1 (minimal activity), A2 (moderate activity), A3 (significant activity), and A4 (severe activity).



3. Steatosis score to detect the degree of steatosis. The result is provided as a score from 0 to 1, proportional to the severity of steatosis, with a conversion to the SAF scoring system (from S0 to S3). The four scores of histological scoring system are: S0 (no steatosis), S1 (minimal steatosis), S2 (moderate steatosis), and S3 (steatosis activity).



Global Usefulness of AI and Neural Network-Based Test in CLD

AI and neural network-based tests have been successfully used worldwide as an advanced algorithm using the combination of serum biomarkers and patient demographics for staging of fibrosis, inflammatory activity, and steatosis of liver disease in adult NAFLD patients from asymptomatic early stage through non-malignant late stage.

Early liver disease detection allows patients treatment options for a healthier and productive life. Once liver disease progresses to cirrhosis or cancer, treatment options are limited and expensive. To reduce the huge global economic burden impact of chronic liver disease, it requires a breakthrough technology, which brings diagnosis to the patient.

Non-invasive diagnostic tools such as AI and neural network-based tests are easy to perform, less expensive, and readily available, and can aid in the early diagnosis and better prognosis in patients with NAFLD and NASH. After proper consultation and examination by your healthcare provider/attending physician, a prescription is required by your laboratory to obtain an AI-based neural network test.

Innoquest Pathology offers:

Panel Code	Test	Specimen Requirements
LFT	LiverFASt	8ml Plain (Gel-YELLOW) & 3ml Fluoride Oxalate (GREY) *Fasting/Gender/Age/ Height & Weight*
FI4	Fibrosis 4 (FIB4) Index	

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