AUTOMATION IN CYTOLOGY

Challenging cases represent failure to detect abnormalities existing at the time of screening

By Nelson Barayuga, MBA, MT/CT(ASCP)

The most challenging cases in cytology are those representing failure to detect abnormalities existing at the time of screening. Improvements in sample collection and screening all attend to these concerns; and it is worthwhile to acknowledge current automated technologies focusing on liquid-based, thin-layer cytology and algorithm-based computer screening.

These common products come to mind: ThinPrep by Hologic, and SurePath by Becton-Dickinson. Both are FDA-approved methods incorporating human oversight, are widely accepted and extremely functional in high volume reference laboratories.

Method Rivalry

Cervical smear preparation involves two distinctive approaches. In conventional cytology, there is the transfer of cervical material from a collection instrument onto a glass slide; whereas in liquid-based cytology, the collection instrument is rinsed in liquid to produce a suspension, which is then processed to produce a thin layer of cells.

The underlying thread of these automated methods is a fundamental denominator — they use liquid-based smear preparation, with instrumentation and methodologies differentiating each specific platform.

Since the late 1990s, we have seen the increased use of collection vials containing a liquid medium (alcohol-based) preserving the cells. The samples are processed in the laboratory into a thin layer of cells, stained and screened with an automated system. If required, a manual confirmation by light microscopy is done.

Although conventional cervical smears have been the norm for decades and used to manually screen for cervical cancer and precancerous cells, liquid-based cytology and automation have steadily gained ground, and although not necessarily a threat
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to conventional slide preparation (and manual screening), these instrumentalations have paved the way for changes in screening regulations and workload limits.

However, opinions vary on whether liquid-based cytology is more accurate than conventional methods.

Morphologic screening of gynecologic samples from conventional smears to liquid-based preparations all address the evidence (or lack) of cervical lesions. Evaluating the diagnostic performance of these automated technologies for detecting cervical lesions can be challenging.

All automated screening of liquid-based cytology involves algorithms directing the cytologist’s attention to abnormal cellular morphology, which in turn requires visual confirmation. Applying standard criteria for evaluation of these diagnostic tests is possible because the ultimate result is similar, but as cytology professionals, we are keenly aware the sensitivity and specificity of these newer technologies can get subjective.

Confirming the selected fields of interest chosen by these automated systems brings us back to basic screening.

The area and thickness of the smear will definitely contribute to our preference in screening, and as cytotechnologists, it is common for us to favor one type over another.

This is probably the overwhelming reason test characteristics are somehow difficult to properly assess or compare. It seems one method outshines the other depending on the literature at hand.

Most publications compare results of screening using the newer technologies with an expert panel review of the cytologic specimen. In those cases, the findings based on morphology can relate to the status of the cervix but are still challenged with the determination of false-negatives — and thus sensitivity, specificity and negative predictive value may be in question.

Patient information and history is essential; luckily in such cases the clinician can subscribe to other diagnostics such as molecular testing. With patient care being foremost, it is difficult to gauge whether newer automated technologies are better than conventional cytology.

As we witness in the cytology laboratory, conventional smears have endured these changes, and will be around for a while.

**Productivity and Cost Effectiveness**

It is easy to identify productivity outcomes defining cost effectiveness by incorporating these automated tools. Our profession is tied to a system allowing for subjectivity, and it is interesting how we do so whenever we have the chance.

A practical reference standard between conventional or liquid-based cytology can be defined because it is still cellular morphologic criteria and patient history considerations needed for a meaningful diagnosis.

Although specimen preparation is different, it is required that instrument screening results must correlate in some way with conventional morphology. On a practicality note, the diagnostic outcomes are the same, but there is an obvious market advantage of liquid-based systems when it comes to productivity.

**Market Factors**

Liquid-based cytology is more expensive than conventional cytology, but it does provide the added ability for adjunctive testing (such as human papillomavirus testing), faster reading times and cost savings due to automation.

Whether this benefit warrants the increase in cost will always depend on a number of factors that may vary across different practice environments.

**‘New Normals’**

It is hard to pinpoint the advent of cytotechnology’s “new normals.” These are workplace conditions that came by and decided to stay. The reality of workplace automation with the ability of computers to identify fields of interest most likely to contain abnormal cells is amazing (and so are the associated slide limits).

Instrumentation improving the healthcare delivery can be seen everywhere, and cytology is no exception. Luckily, as we master these instruments, we keep ourselves competent. But there are times when we have to deal with these new normals more than we would like.

**More Ways to Screen**

In the last decade, these automated instrumentations for screening using computer image analysis systems have successfully defined the profession. Perhaps gynecologic cytology is due for a method that can be implemented into a national screening program, if ever.

And why not? With the current healthcare atmosphere of spiraling cost (and government spending) being a gnawing concern, this shouldn’t be a far-fetched idea. Automated instrumentation may improve sensitivity, reduce unsatisfactory specimens and provide for reasonable bottom lines; and as a system, automation may provide for practical and economic sense.

Meanwhile, as cytotechnologists we continue to contend with different screening formats and different microscopes — one for ThinPrep, one for SurePath and the one for conventionalss — sometimes all on the same table, just different ways of looking at the same cells.

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