

Validation of a novel robotic telepathology platform for neuropathology intraoperative touch preparations.

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Background

Many clinical settings do not have the caseload or resources to support a fully interdisciplinary on-site pathology program. For those sites, remote pathology can be used to support clinical operations and decisions. Robotic telepathology (RT), available since the 1990's, has been used in some locations, but has not been widely employed. Some locations instead use a camera mounted to a microscope, which is operated by local personnel under guidance from a remote pathologist, while other systems use whole-slide imaging (WSI) to send digital images to a consulting pathologist. All three systems have inherent problems which limit their abilities. Traditionally, while RT offers the remote pathologist the most control, it is typically expensive and slow. Microscope-mounted cameras offer good cost and faster operation, but less control by the pathologist. WSI, while not ideal for cytologic smears, (which take more time to process completely), has otherwise emerged as the most effective tool for most pathology operations.

Goal of Study

The study goal was to validate the use of RT on a dual-purpose resource that enables both WSI and RT — the VENTANA iScan Coreo Au WSI scanner by Ventana Medical Systems, Inc. in Tucson, AZ, USA. The iScan Coreo Au includes a LiveMode software module that allows remote microscopy and robotic telepathology. In the study, the authors compared the results of RT through LiveMode to conventional on-site microscopy.

Materials

The authors used two iScan Coreo Au scanners to scan a set of 100 slides from archived cases, including 75 neuropathology slides and 25 general surgical pathology slides. The cases chosen were originally performed without telepathology. The pathologists reviewed each slide image on standard desktop computers with 1280/1064 resolution monitors, with no special settings or software.

Methods

Three neuropathologists and one general surgical pathologist reviewed all the slides as both glass and digital samples. Each used the LiveMode software to remotely review two rounds of 25 cases, one round from each scanner, with only a brief clinical history for each case. Each round of reviews was nine months apart. Each pathologist also reviewed the glass slides via conventional microscopy, but not within three weeks of having reviewed the digital version. The validation method was based on a draft of the College of American Pathologists (CAP) consensus statements for WSI. Each participant was trained in the use of LiveMode prior to the study and provided an interpretation, date and time spent for each case, with any optional comments.

The results were compared to the results from the archived glass slides, with intraobserver variability as the basis for comparison. The study was approved by the hospital system's Institutional Review Board.

Results

Of the 200 total cases, there were 152 with perfect intraobserver agreement and 38 with minor variances. There were a total of nine

cases with major variances, which were compared to the final sign-out diagnosis. Of the nine, three of the RT slides matched the sign-out diagnosis (meaning three of the original glass slide interpretations were incorrect), three of the RT interpretations did not match the glass slide or sign-out diagnosis, and in three cases, neither the RT or glass slide interpretations matched the sign-out diagnosis, for nearly identical statistical results.

Conclusions

The authors found that using the VENTANA iScan Coreo AU scanner and LiveMode

software module for both WSI and RT was a workable solution. The results showed that when performing RT, misinterpretations occurred at approximately the same rate between traditional glass slide interpretation and RT. The authors concluded that robotic telepathology with the iScan Coreo Au from Ventana Medical Systems, Inc. was “a reasonable means of providing intraoperative neuropathology expertise to remote sites,” with the added benefit of also enabling on-site WSI.

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