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ABSTRACT

Anatamage Table 6, which launched in the fall of 2018, is the latest software for users of the Anatamage Virtual Dissection Table. Anatamage Table 6 comprises numerous virtual anatomy dissection and study tools for use by anatomy students and instructors. This review provides an overview and assessment of Anatamage Table 6's primary tools and advanced navigation features.

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KEYWORDS: Anatamage Table 6, 3D Virtual Anatomy Tools, virtual dissection, anatomy education, medical simulation technology

INTRODUCTION

The Anatamage Virtual Dissection Table is a life-sized three-dimensional (3D) anatomy visualization table that supports human and animal anatomy learning and instruction. The Anatamage Table is equipped with a touchscreen that allows users to interact with and dissect various gross anatomy and regional anatomy models.¹

The Anatamage Table 6 software is the latest update that was released by Anatamage in the fall of 2018. Table 6 contains a new gross anatomical model and new regional anatomy

models with enhanced anatomical details. Table 6 also includes new clinical and histology cases, as well as a prosection library that includes photorealistic cadaver images to complement the cadaver lab experience.² The Anatomage Table EDU 6.0.2 software update is evaluated in this review.

NAVIGATION

Table 6's navigation pane is set up to provide access to commonly used features and icons. These features include how models are viewed, dissected, positioned, and saved for use. The Volume Orientation icons allow the user to rotate or move the model into various viewing positions. The Dissection Tool gives the user the ability to make custom or linear cuts on the model to expose structures from beneath the cut. The Clipping Plane icons and slider bar allow the user to remove selected areas completely. Users can choose from predefined clips or prepare their clip of the model.

The Explore Tool icon reveals the Remove Tool, Blood Flow Tool, and the Isolate Tool. The Remove Tool allows the user to type anywhere on the rendered model tool to remove a structure. If structures are stacked on top of each other, the outermost structure will be removed upon touch. Using the Blood Flow tool, users can see the path of blood flow coming to and from the heart by selecting a vein or artery. The Isolate tool allows users to focus on a single structure, making all others transparent while annotating the selected one.

The Visibility Control and the corresponding slider bars allow the user to control what structures are present in the viewing space. Using the Visibility Control icon enables users to turn on and off selected structures that are categorized by systems and categories. The Presets icon lets users save rendered views for quick access. Tapping on it will show numbered presets 1-10, but additional saved presets can be pulled up from the cogwheel icon at the bottom of the

numbered list. Additionally, these presets can be exported and imported from the computer or USB drive.³

DESCRIPTION OF TABLE 6 FEATURES

Anatamage Table 6 provides users with access to the table's features through the main toolbar. Table 6's features are contained within the following modules: OpenFile, Import PACs, Gross Anatomy, High Res Regional Anatomy, Case Library, Histology, Curriculum, and Prosection (see Figure 1).



Figure 1. Anatamage Table 6 main toolbar. Reproduction of image with permission of Anatamage Inc.

The OpenFile option allows users to open their uncompressed Computerized Tomography (CT) or Magnetic Resonance Imaging (MRI) files that are saved in the Digital Imaging and Communications (DICOM) standard format from a USB drive. Users can view their uploaded images in the same manner as CT and MRI images from the case library. However, uploaded DICOM images will not have full visualization and dissection capabilities as the gross anatomy models and high-resolution regional anatomy models. The Import PACS option allows for the import of medical images from Picture Archiving and Communications Systems (PACS).⁴ PACS are used by healthcare facilities to store and transmit medical images securely.⁵

The Gross Anatomy tab provides access to four full-body cadaver models and one full-body CT with overlaid idealized models. Table 6 includes one male and one female full-body Caucasian cadavers and one male and one female full-body Asian cadavers.⁶

The High-Res Regional Anatomy tab includes numerous regional scans that were taken from male or female Asian cadaver models. These regional scans were performed at the original

0.2 milliliters resolution, so these scans are more detailed than those included with the gross anatomy models.

The Case Library contains an extensive collection of CT and MRI scans that are divided into regions and other categories, including embryology and animal scans. The Case Library also includes premade comparison cases, and it allows users to create custom comparison cases by selecting multiple scans for side-by-side comparisons. Also, the Case Library includes 4D regional scans, where the fourth dimension represents changes in these regions over time. Specific filters allow users to view certain scan types, such as MRI, fracture, cancer, and pediatric scans. Users can also perform keyword searches within the Case Library to locate specific scans by case titles and descriptions.⁷

The Histology Library includes a collection of microscopic tissue slides that are organized by system. Users may also use the search function to locate slides showing specific issue types.⁸

Curriculum Types

The features of Table 6 are well suited for a systems-based approach to anatomy instruction, as organ systems can be turned on or off within the Visibility Menu. In addition, regional anatomy models are available under the Curriculum Menu, offering both Segmented and DICOM Anatomy options. These options provide models of specific areas of the body that are commonly used in regions-based anatomy instruction: head and neck, thorax, abdomen, pelvis, upper limb, and lower limb. The Segmented Anatomy option provides high-resolution, fully segmented scans which allow users to explore these anatomical regions, in the same manner, as they would use the full Gross Anatomy models. Alternatively, the DICOM Anatomy models are a collection of annotated CT and MRI scans. Annotated sections of the scans are

easily accessible using the View Sequencer tool, and users can also create custom annotations and views with the Pen, Pin, Craniotomy, and Clipping tools. The density of the volume rendering for each scan can also be adjusted, which regulates how much of the scan is being shown, thus allowing for better visualization of deep structures (see Figure 2).

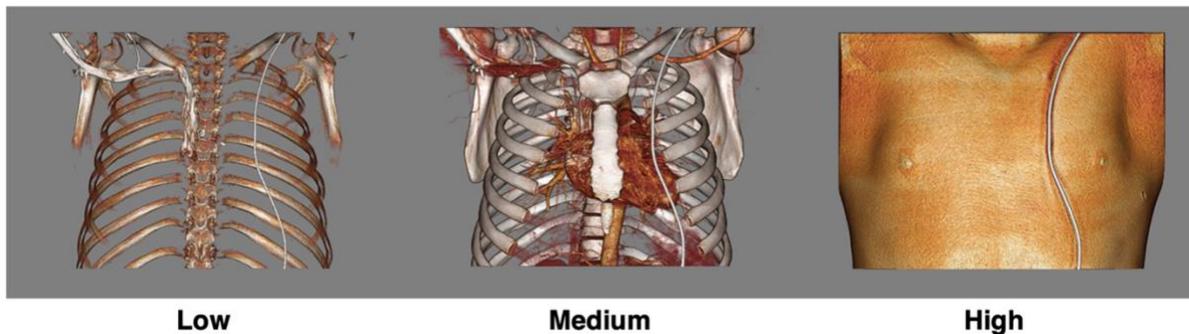


Figure 2. Thorax DICOM volume render at low (left), medium (center), and high (right) densities. Reproduction of image with permission of Anatomage Inc.

Quiz Mode

In Table 6, the Quiz Mode icon consists of five quiz types to assist with self-study or instructional assessment. These five quiz types include: Pick Me, Flashcards, Multiple Choice, Game, and Highlight.

Pick Me allows students to select the correct structure as prompted on the screen and provides a summary at the completion of this quiz. Flashcards provide users with a structure name. They must then select the corresponding structure. Unlike the Pick Me function, Flashcards allows users to see an immediate answer after each selection is made along with a results summary after ending the session. Multiple Choice is set up similar to what a student would see when answering a multiple-choice question on an exam. Users are presented with a highlighted structure and given five possible names to choose.

In the Game session, users can compete against each other for points. This session allows users to select from 2, 4, 6, or 8 players. Similar to the previous quiz types, players are provided with a results screen at the end of the game containing the final points tally. The Highlight session offers users a structure to identify. As this session includes no structure names, it requires the user to know the structure without prompting. This type of quizzing method would be ideal for oral evaluations while the other quiz types would lend themselves well to individual and group study.

For each selected quiz type, users can choose what information is included in the quiz from among three methods of game creation: Customize, Ready Made, and History. The Customize feature allows users to build quiz material from imported annotated presets or to select from visible structures on the current model. The Ready Made options are categorized by region and by the system. The History function allows users to choose a previously used ready-made quiz or customized quiz.⁹

Prosection

Prosection cadaver images are one of the new features of the Table 6 upgrade. Sixty photorealistic models are available that portray both anatomical regions and specific organs.¹⁰ These models are built from external images and are not volume-filled, which prevents the use of the dissection and other exploratory tools. However, the pin and pen tools can still be used to label structures, and presets and exportable images can be created from the prosection models. This feature provides students with access to actual cadaveric images, which are closer to what they will encounter in a future career in the health sciences, compared to the idealized imagery used in the full gross anatomy models.

ADVANCED FEATURES

Table 6 includes updates to current tools such as Screen Capture and the Measurement Tool. Once housed under Image Control Settings, Screen Capture is now directly available from the navigation pane, making it easy to take a screenshot of the table with or without the icons visible and save it as a .jpg, .png, or .bmp file. The Measurement Tool brings up options for measuring the distance or angle of a specific area.

Other new features added to Table 6 include the Action Menu and Layout. The Action Menu gives users the ability to control selected structures with commonly used tools and features the new Origin and Insertion tool. This new feature will highlight muscle origins and insertions on a selected bone using standardized colors (red for origins and blue for insertions). The Layout icon offers six viewing methods: 2D, 3D, 3D-2D, Histology, Flythrough, and Curved Planar Reformation. The Flythrough icon shows the 3D rendering of the full structure on one side of the screen and a fly through of that structure on the other side. This feature can also simulate the use of an arthroscope, which allows users to explore interior joint structures. The Curved Planar Viewer lets the user create a linear or curved spline on the 3D rendering.¹¹

ASSESSMENTS

Benefits

The Anatomage Table 6 offers visually impressive gross anatomy models. These models provide idealized images, which may enhance the ease of learning for those who are new to the subject. Additionally, more realistic imagery, much like what students will encounter in the cadaver lab, is also readily available. Navigating the applications via the touch screen is intuitive, as it mimics the usability of smartphones and tablets, therefore allowing the user to focus on the anatomical models rather than device functionality immediately.

The Table offers several features that facilitate student learning. The ability to participate in virtual dissections reinforces the spatial relationships among anatomical structures and provides a primer before performing dissections in the cadaver lab that are not available from two-dimensional textbook images. There are multiple ways students can self-teach and test their anatomical knowledge all in one place. Several of the self-teaching features of the Table provide interactive and, in the case of the Blood Flow tool, animated representations of anatomical structures and processes that cannot be replicated in the classroom through traditional teaching methods.

Opportunities for Improvements

There are a variety of ways in which users can create custom images, place annotations to those images, and save or export their work through the preset dialog and screenshot tools. Unfortunately, there is currently no way to integrate course-specific lessons directly with the software. Such features are available through other virtual anatomy tables. Additionally, during the creation of custom images, it is relatively easy to lose your work in the event the Structure or Branch Slider Bars are engaged – the touchscreen is sensitive enough that a shirtsleeve can employ these tools. Disengaging these slider bars locks the Visibility Menu and Explore Tool while the Dissection Tool remains active. Anatomage promotional materials and presets also demonstrate custom videos or features that are difficult, or not possible for users to create or customize on their own; Flythrough videos are one such example.

Smaller structures on the gross anatomy models do not offer the detail necessary for more nuanced anatomical study, which can limit the use of the Table in advanced undergraduate or graduate courses. Additionally, some features, such as the Prosection Library, require prior knowledge of the anatomical orientation of structures, as these images do not provide orientation

labels (i.e. anterior, posterior, etc.). Without such a background, these images can be difficult for the user to decipher. Additionally, there are some, but not many, inaccuracies present in the labeling of structures.

While the Anatomage Table 6 software is relatively stable, there are several glitches that we have experienced throughout its use. We want to note, however, that when this has occurred, the Anatomage Table Support team has been responsive to our inquiries and concerns.

CONCLUSION

The Anatomage website states that "students have a full cadaver lab experience. They are provided with medical school-level anatomy content without needing to be in a cadaver lab".¹² While this is technically true, the virtual tables do not offer the same experiential learning opportunity that working directly with cadavers does, as it lacks a tactile learning element that can further solidify the foundations of knowledge gained in the lab. Anatomage Table 6 is an excellent supplementary tool for cadaver-based anatomy programs, and provides access to interactive cadaver models for institutions that do not have the facilities to support a cadaver program, but does not replace the cadaver lab as an instructional resource.

Notes

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