

A Novel Application of the MIRC Repository in Medical Education

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Medical students on the radiology elective in our institution create electronic presentations to present to each other as part of the requirements for the rotation. Access was given to previous students' presentations via the web-based system, Medical Imaging Resource Center (MIRC) project, created and supported by the Radiological Society of North America (RSNA). RadPix Power 2 MIRC (Weadock Software, LLC, Ann Arbor, MI) software converted the Microsoft PowerPoint (Redmond, WA) presentations to a MIRC-compatible format. The textual information on each slide is searchable across the entire MIRC database. Future students will be able to benefit from the work of their predecessors.

KEY WORDS: MIRC, radiology teaching files, PowerPoint, medical education, slides, RadPix, RSNA, education

In the past, radiologic teaching cases were archived according to the American College of Radiology (ACR) diagnosis codes. Unless people were careful returning the films to their proper locations, the archive becomes disorganized and less functional over time. Limiting access to the teaching file was one solution, but that would prevent medical students and residents from using it for self-directed learning. The ACR codes have not been updated for several years, and many newer diagnoses do not have a code. Many times educators want to only find certain diagnoses by modality, which is not supported either by the ACR coding scheme. To address these shortcomings, individuals frequently developed their own hybrid coding scheme to meet their goals.

In today's PACS environment, images are now saved in several formats, including JPG, TIFF, and DICOM. Cataloging the images is now frequently based on naming the image file by patient name and/or diagnosis. A hierarchical folder structure

may be created on the computer, with all pancreatic cancer cases put in one folder for instance. Microsoft PowerPoint (Microsoft Corp., Redmond, WA) is the standard for electronic presentations in radiology. Cataloging these presentations on a Windows-based PC is limited to using the indexing feature of Windows, which tends to slow down the computer. Finding an individual case within a large number of presentations frequently requires the time-consuming task of loading each presentation, then searching for words within it.

With images so obviously critical to the field of radiology, it is somewhat paradoxical to not have a standardized catalogue and index of images.¹ The long-term development and support of the Medical Imaging Resource Center (MIRC) by the Radiological Society of North America (RSNA) serves to potentially solve many of these concerns. Still, MIRC may generate as many questions as solutions.^{2,3} Confidentiality concerns, organization and standardization of a vast and diverse body of data, the evolution of search tools, and proper citation of authors are all viable barriers and concerns associated with the genesis of MIRC.^{1,4}

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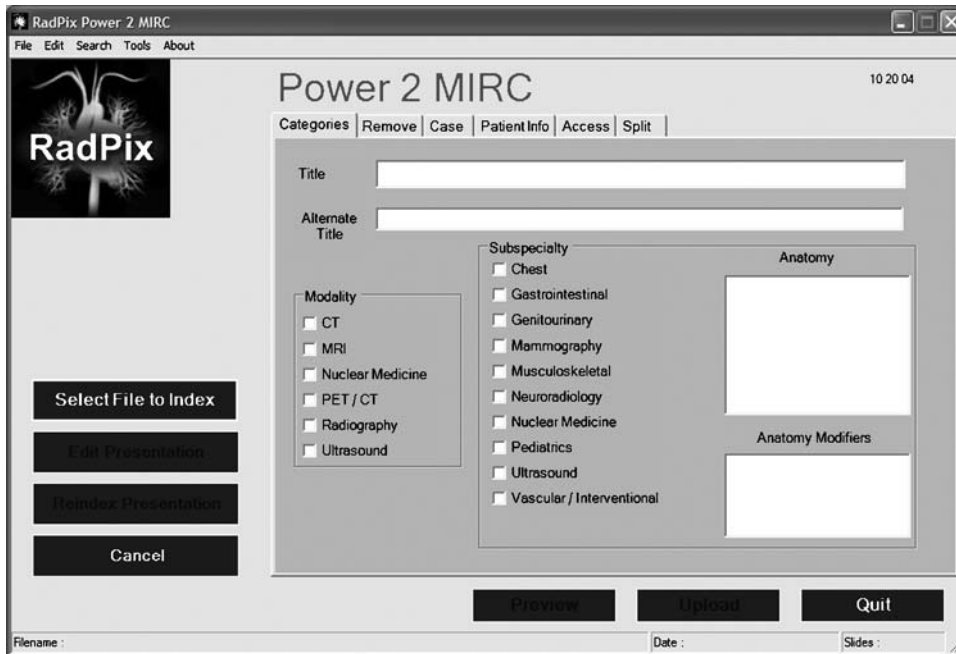


Fig 1. RadPix Power 2 MIRC Powerpoint indexing program.

In this article, we outline a simple and novel method to organize and share information using MIRC software that can be utilized in a variety of ways to further medical education.

MATERIALS AND METHODS

Medical students taking the Clinical Radiology elective during their fourth year of medical school at our institution are required to present before the group of students on the rotation using Microsoft PowerPoint. A set of 123 student-authored class presentations dating back to 1999 was retrieved from the original compact disks. In order to be used as a resource for future medical students, it was decided to organize them and make them available over the radiology department intranet. We removed superfluous information from the presentations and standardized them with a single PowerPoint template. The template created included a dark blue background, yellow and white text in 28–40 point size, and our Medical School logo. Students enrolled in the classes in the future are expected to use the standard institution Powerpoint template in creating their own seminar to facilitate seamless entry into the MIRC system. All radiologic images were cropped to remove patient name, registration number, study date, and other identifiers. A default MIRC web server installation running Windows Server 2000 (Microsoft Corp.) was set up. Using RadPix Power 2 MIRC (Figure 1) (Weadock Software, LLC, Ann Arbor, MI), we uploaded each Powerpoint file onto a department MIRC web server. As no patient information is contained in the data added to the MIRC database and the files are used specifically for education purposes, the project was not subject to Health

Information Portability and Accountability Act (HIPAA) regulations.

DISCUSSION

The MIRC system was developed to create a standard by which radiologists could store images and information on a web server and allow that information to be queried at a later time. Over the past few years, the World Wide Web has transformed from being predominately based on HTML files, which contains both data and formatting information, to XML files, which contain the data, and XSL files, which contain the formatting for a web page. The details of this may be viewed at <http://www.w3schools.com>. The same XSL file is typically used to provide formatting for many XML files. These provide consistency of use and feel to an entire web site. In addition, by changing features of the XSL file, all pages which rely on it are then immediately updated with the new formatting. XML may also be used to allow unrelated software programs to exchange data with each other.

The open source MIRC software may be downloaded and used at no charge from RNSA <http://mirc.rsna.org>. The software consists of

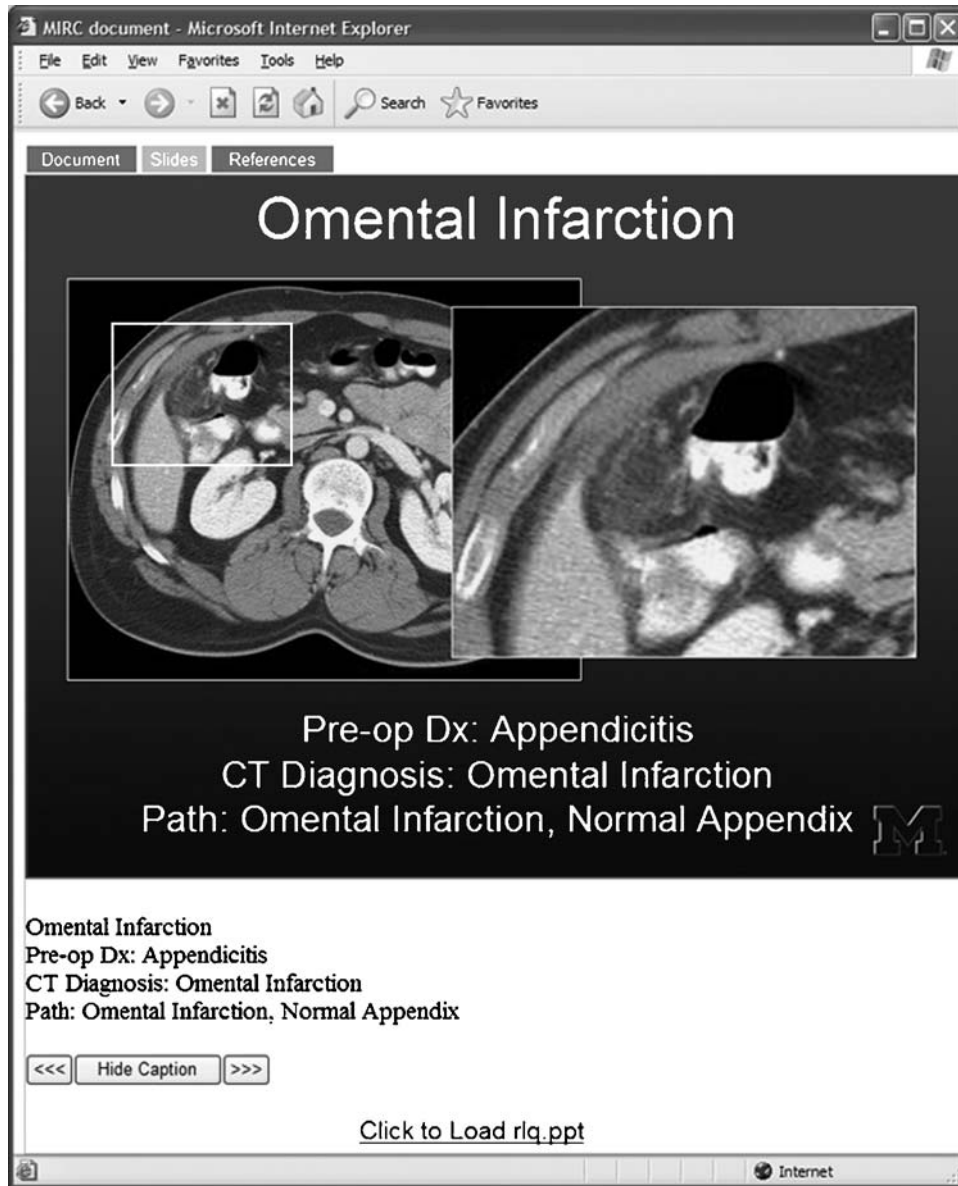


Fig 2. Sample slide from a presentation indexed with Power 2 MIRC and displayed in Microsoft (Redmond, WA) Internet Explorer 6.0 web browser. Below the image of the slide is all the text extracted from the slide, including text which is obscured by overlapping images. Clicking the Hide Caption button toggles the text display. All extracted text is searchable via the query page. "Click to Load" link may be clicked to download the original PowerPoint file for use.

several modules, including a web server which includes the ability to upload MIRC-compatible XML files, a query module for searching for information, and also an authoring tool.

Several steps are required to set up a MIRC system, all of which are documented at the above web site. Two programs must be installed, including Sun (Santa Clara, CA) Java Software Development

Kit (SDK) and Apache (Forest Hill, MD) Tomcat web server. The MIRC application software is then installed. There is a step-by-step installation process in which the user is prompted to fill in information regarding the web site, including name, uniform resource locator (URL), etc. Additionally, a user forum has been created (<http://forums.rsna.org/forumdisplay.php?forumid=9>) in



Fig 3. MIRC web server query page.

which users can ask specific questions regarding the program. Administrators of the system also create users and grant specific access privileges which include the ability to publish documents to the website and allow read access to certain documents. A simple-to-use web page facilitates these functions. Other types of documents can be created using the built-in authoring tool.

Powerpoint files are not directly indexed by the MIRC server. RadPix Power 2 MIRC software leverages the benefits of MIRC and XML with the ease of creating Powerpoint files. It collects all of the textual information from a Powerpoint file, then creates a MIRC-compatible XML file. A JPG image of each slide and the original Powerpoint PPT file are then uploaded along with the XML file to the MIRC web server.

Once the user selects a presentation, the presentation will be viewed with navigation tabs within a browser (Figure 2).

We have made it very simple to access MIRC files from our department intranet. By opening any web browser to our MIRC website (Figure 3) the user is presented with a screen very similar to Figure 1, which is similar to the worldwide MIRC interface, found at <http://mirc.rsna.org>. We have configured our system to run several MIRC

servers, including a separate one for the medical student lectures. One can choose which server to search by highlighting it, or may search several by holding down the shift key while clicking on other servers. Immediately below the list of searchable servers are six tabs which the user can manipulate to hone down the search. These allow the user to filter the results, such that a search can be performed for files created by only a certain author for example. The user can search by additional criteria such as diagnosis, imaging modality, lab values, and pathology by navigating through the other available tabs. The user will type in their search request and will be given with all files present on the MIRC server that have that particular title, keyword, or imaging modality incorporated into them. For example, a student can search for a CT scan of appendicitis via the UM Med-School server. A "free text query" of "appendicitis" will be directed to a list not only of the three student-authored Powerpoint files focusing exclusively on the clinical picture, diagnosis, imaging, and treatment of appendicitis, but also additional files on pediatric emergencies, ultrasound, and abdominal pain workups.

Medical students in particular stand to gain from the evolution of MIRC. It opens up opportunities

to search outside a local institution for cases, for example, unique to other patient populations. Exposing medical students early in their medical careers to MIRC could have a powerful impact on education. Many medical students today are very comfortable with peer-to-peer file sharing software, such as those available at <http://www.kazaa.com>⁵ and <http://www.napster.com>.⁶ In addition, having easily accessible images on MIRC offered to medical students early in their medical school curriculum may pique the interests of those who would otherwise not have been exposed to the field of radiology until their third or fourth years.

Money and manpower are necessary to maintain a database of teaching files and Powerpoint presentations. One of the benefits to our very cost-effective system of uploading presentations onto the department MIRC server is that it allows the content of each Powerpoint presentation to be "searchable." Thus, a MIRC "free text query" of "lymphoma" returns presentations and teaching files dealing exclusively with lymphoma but also those on PET-CT and lymphoscintigraphy, as long as the word "lymphoma" is included somewhere in the file. Note that a file that contains "lymphoscintigraphy" and not "lymphoma" will not be returned in this search. The flexibility provided by using the MIRC interface makes it a clearly superior alternative to query for information than most other methods of seeking data. The cases may also be browsed sequentially via the "Case Navigator," so all presentations may be reviewed.

Concerns about giving other people access to one's own work may be alleviated by configuring the MIRC server to only allow access based on username and password. By having both a departmental and a password-protected personal MIRC server, the user can save information either for public or private access.

A number of colleagues have already incorporated cost-effective image databases into their practices already and have published good results.⁸⁻¹³ Tran et al.⁸ converted images to JPEG format and used commercially available database software by Microsoft⁷ to compile cases with associated data such as history, diagnosis, birth date, study date, among others. Maldjian and Listerud¹¹ generated a tagged image file format (TIFF) digital archive for use on any platform supporting file transfer protocol (FTP) that operates in the background

and automatically generates a searchable index of case information in the database. Recently, Tellis and Andriole¹⁴ described a method of integrating an existing teaching file with MIRC. No reports to date have discussed the potential impacts of the MIRC project on medical education.

We expect that as MIRC use increases in our department, more faculty and residents will offer their works for the MIRC database for all to share. Morning and noon didactic lectures, Grand Rounds presentations, along with the teaching cases are all candidates for storage on MIRC. The advancement of the worldwide MIRC archives allows individuals to share knowledge and cases with a wider audience than was ever before possible. Finally, MIRC may evolve to encompass many other functions within clinical practice. For example, there is no reason that the MIRC project should be limited exclusively to the field of radiology. As the leaders in clinical informatics and computer applications in medical practice, radiologists can market this product to other departments within their respective institutions as a tool with which they can store and share their own teaching files, presentations, and data. There is no such available system yet in place for orthopedic surgeons to share arthroscopic photos or for general surgeons to store laparoscopic images, and the MIRC project can make this possible today.

CONCLUSION

The MIRC archiving system is a cost-effective and efficient medium for storing and sharing teaching cases and Microsoft Powerpoint lecture files. In this report we discuss an extension of the scope of the MIRC database for medical education purposes. As MIRC evolves, more applications may become available to fully realize its value.

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