PACS a User Interface in Oral Pathology

Vadde Venkata Naga Sunil, Madhusudan Reddy, Harshavardhan S Jois, Mrunalini K.

ABSTRACT

Introduction: Diagnosis and histopathological evaluation in oral pathology has evolved over the years considerably and picture archiving and communication system (PACS) is one such comprehensive computer system that is responsible for revolutionizing the digital storage and distribution of high resolution medical images for diagnosing various pathologies using the the digital pathology interface.

Objectives: Current COVID-19 pandemic situation has a significant impact on routine pathology services. Digital pathology can play a key role in safeguarding the clinical services and pathology based research in both current and future. Current review highlights the importance of Picture archiving and communication systems (PACS), its uses, impacts, advantages and disadvantages for the end users, i.e, oral pathologists.

Materials and Methods: Literature review of several peer reviewed articles with the key word "PACS" were searched from the archives of indexed journals.

Result & Conclusion: It was found that integrating PACS to oral pathology practice is pertinent and is necessary in the present global digitalization era.

Keywords: PACS (picture archiving and communication systems), interoperability, telepathology (TP), DICOM (Digital Imaging and Communications in Medicine), digital pathology (DP)

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INTRODUCTION:

A picture archiving and communication system (PACS) is a comprehensive computer system that is responsible for the electronic storage and distribution of medical images in the medical enterprise.[25,1] Oral Pathology focuses mainly on the identification of structural anomalies, through the naked eye or a microscope, and on the detection of possible relationships with functional disorders of tissues, therefore, identifying diseases.[28,2] The aim of pathology has remained unchanged over time; focused on the analysis and comparison of tissue specimens on specific glass slides. For this, the use of optical microscopes has been fundamental since it was the only available instrumentation for centuries.[3] Despite using very methodical analysis workflows, the same professional can draw different conclusions about the same specimen at different times. Moreover, asking for second opinions is common practice.[4] Consequently, there is a requirement for glass slides and specimen storage, a very expensive process, requiring accessibility, cleaning, and protection, which entails greater care by specialized staff.[33,30] In contrast, digital storage and Use of Open Communication Platforms like PACS for diagnosing various pathologies make a user interface digital pathology a fundamental tool in our daily work by allowing us access to very varied samples, in a very short time and from very distant places.[33,18,5]

USES OF PACS:

1. Information on the conventional glass slide is replaced by digital soft copy.[6]

Army College of Dental Sciences (ACDS). Kaloji Narayana Rao University of Health Sciences (KNRUHS), Telangana, India.

Corresponding Author: Vadde Venkata Naga Sunil, Army College of Dental Sciences (ACDS), Kaloji Narayana Rao University of Health Sciences (KNRUHS), Telangana, H.No: 1-4-212/71, Greenpark Enclave, Kapra, Sainikpuri, ECIL Post, Secunderabad, Telangana – 500062. Email Id: vvnssunil@gmail.com.

2. Remote access: It expands on the possibilities of conventional systems by providing capabilities of off-site viewing and reporting (distance education, telediagnosis).[7]

3. It enables practitioners in different physical locations to access the same information simultaneously by telepathology.[32,2]

4. Electronic image integration platform: PACS provides the electronic platform for pathology images interfacing with other medical automation systems such as Hospital Information System (HIS), Electronic Medical Record (EMR), Practice Management Software, and Radiology Information System (RIS).[25,8]

5. Pathology Workflow Management: PACS is used by pathology laboratory personnel to manage the workflow of

PACS WORKFLOW DIAGRAM:

Doctor — Microscope — Camera — Slide Scanner — WSI — PACS — Analysis Systems / Workstations
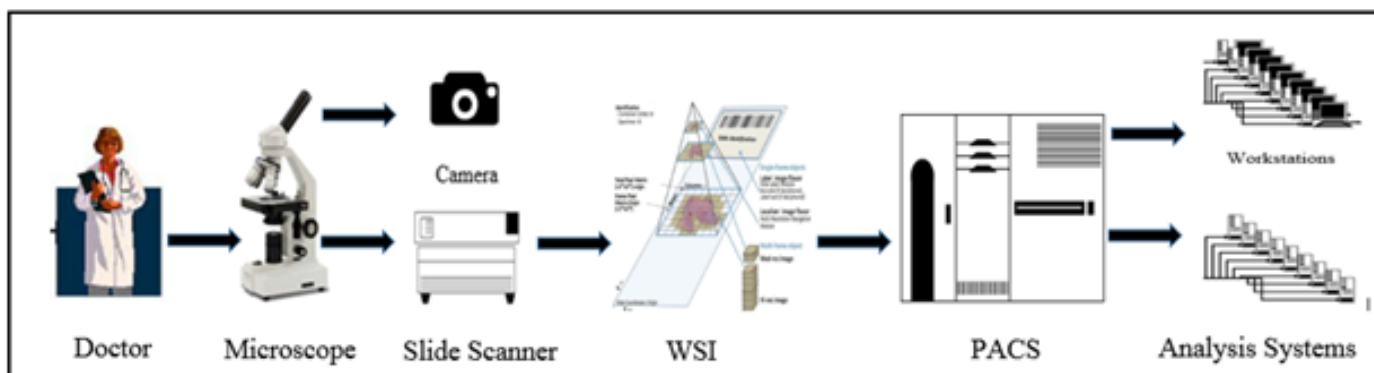
patients in histopathology biopsies, cytological smears, and hematopathology.[28,9]

WHAT'S THE IMPACT?

Many users across the globe use it for their daily work, for communication with their peers and education of the new generation of pathologists.[11,12] Those IT solutions link together records or storage resources among multiple campuses or remote facilities, treat distributed images and remote files as if they were local, automatically create multiple replicas of images at distributed sites on the grid - and enable automated failover to those copies in case of a disaster or unplanned downtime.[24,21] Further foreseeable work in providing Internet tools and databases and visionary thinking will provide major progress soon in the advanced use of digital technologies in the oral pathology practice.[29, 28,6]

ADVANTAGES:

1. Once an image has been acquired onto PACS it cannot be lost, stolen, or misfiled.[11]
2. Simultaneous multilocation viewing of the same image.[27,1]
3. The PACS database ensures that all images are automatically grouped into the correct examination, are chronologically ordered, correctly orientated and labeled, and can be easily retrieved.[26,1]
4. Working with soft copy images on monitors allows the full gamut of computer tools to be used to manipulate and post-process the images.[27,13]
5. Ideal for teaching and training.[21,2]
6. Enhance presentation at clinicopathological meetings.[26,14]
7. Can do things which would be impossible with a glass slide :
   - Image analysis.[28]
   - Measurements.[24]
   - Side by side comparison of images.[5]

DISADVANTAGES:

1. Lack of minimum computer knowledge about software and training[15]
2. Lack of initiation, support of new technology[16]
3. Cost of scanners[22]
4. Image quality and efficiency may be less than conventional microscopy[31]

PACS REPOSITORY ARCHIVED RELATED WORK:

Zainab M. Alalawi et al. (2016)[17] assed (PACS) at three of the ministry of health hospitals in the Riyadh region. The result showed that 70% physicians' views affirm that PACS improved physicians' efficiency, In contrast, only 18% of physicians talked about PACS positively in summary views and 82% talked about the challenges of PACS whereas 20% of radiologists talked about PACS positively.

Nair et al. (2009)[4] did a study on acceptance issues were observed at all levels (faculty, staff, and students) during the phased implementation of digital radiography on an enterprise-wide level. Lack of DICOM conformance of software in dentistry and demonstrable interoperability were major impediments to the acceptance of digital radiographic technology.

Dasueran Kim et al. (2014)[15] did a study on user interface for the Pathology PACS considering user experience could be proposed as a preliminary step, and this study may contribute to the development of medical information systems based on user experience and usability.

Chordia et al. (2016)[2] did a study on A total of 247 histopathologists answered the survey. The overall response rate was 81%. 98% of pathologists felt the need for TP and DP. 34% of pathologists used digital photomicrographic images in routine practice. The utilization of DP in the most efficient way was observed by 48% pathologists mainly to teach in academic institutions. 82% believed that TP is helpful to take an expert opinion whereas only 26% believed that second opinion has to be taken. Concerning limitations, 67% pathologists believed that it's cost-effective whereas 51% revealed high use of TP in the next 5 years.

Milon Amin et al. (2012)[8] conducted study on enterprise-wide PACS- based sharing of pathology images is feasible, provides useful services to clinical staff, and utilizes existing information systems and telecommunications infrastructure. PACS-shared pathology images, however, require a "DICOM wrapper" for multisystem compatibility

CONCLUSION:

Enterprise-wide PACS-based sharing of pathology digital images is feasible, at least in a large academic hospital setting. There should be a concerted effort by institutions to begin leveraging their PACS beyond conventional microscopic methods to enterprise-wide initiatives such as integration of digital images

into the EMR, building decision support tools, supporting quality assurance programs and as a research tool. This service can be cost-effective if existing technology and communications infrastructure can be leveraged. PACS can deliver timely and efficient access to images, interpretations, and related data and reduces the physical and time barriers associated with traditional slide-based image retrieval, distribution, and display.

FUTURE TRENDS OF ARCHIVAL:

1. High Scanning speeds and image resolutions[2]
2. Viewing Advancements and Clinical Decision Support[7]
3. Standards for Archival[9]
4. Multi-Site Collaboration Applications[19]

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