UNLOCKING NEW FRONTIERS: NON INVASIVE TECHNIQUES REVOLUTIONIZING CANCER DETECTION

INTRODUCTION Oral potentially malignant disorders (OPMDs) are a group of conditions that have the potential to transform into cancer if left untreated. These lesions present clinically as white patches (leukoplakia), red patches (erythroplakia), red and white patches (erythroleukoplakia), or oral submucous fibrosis. Approximately 16–62% of OPMDs undergo a malignant transformation and eventually develop into oral squamous cell carcinoma (OSCC). The five-year survival rates of OSCC patients decreases from 80 to 40% if diagnosed at an advanced stage, hence early detection allows for prompt intervention and treatment. Although biopsy is the gold standard, patients still prefer a non-invasive approach for diagnosing his/her disease.

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AIM This poster aims to present a review on the current advances in non-invasive tools for early diagnosis of oral potentially malignant disorders.

MATERIAL AND METHOD A comprehensive search of online databases including **Pubmed, Medline and Scopus** were conducted to identify studies from **January 2010 to Dec 2022 (last 10 years)** using search keywords 'Oral screening devices', 'autofluorescence', 'chemiluminescence', 'oral malignant lesions', 'imaging techniques', 'non-invasive tools', and 'oral dysplasia'. A total of **24 studies** were reviewed and evaluated based on their **sensitivity and specificity**.

RESULTS

AUTOFLOURESCENCE

1.Mehrotra R et al 2010
Velscope (sensitivity-50%; specificity-38.9%)
Vizilite (sensitivity-0%; **specificity-75.5%**)

2. Farah CS et al 2012
Velscope (sensitivity-63%; specificity-30%)

3. Rana M et al 2012
Velscope (**sensitivity-100%;** specificity- 74%)
Biopsy (sensitivity-100%; specificity-100%)

4. Hanken H et al 2013
Velscope (sensitivity-97.9%;
specificity-41.7%)

5. Francisco AL et al 2014
Fluorescence spectroscopy
(sensitivity-88.5%;
specificity-93.5%)

6. Petruzzi M et al 2014
Autofluorescence (sensitivity-70%; specificity-57.69%)
(mild dysplasia as positive lesion)
Autofluorescence (sensitivity-76.47%; specificity-51.28%)
(mild dysplasia as negative lesion)

7. Scheer M et al 2016
Velscope (sensitivity-33.3%;
specificity-88.6%)
Biopsy (sensitivity-100%;
specificity-100%)

8. Ganga RS et al 2017
Velscope (sensitivity-76%; specificity-66.29%)

9. Canjau S et al 2018
Velscope (sensitivity- 94.44%;
specificity-100%)

10. Chiang E T et al 2019
Autofluorescence (sensitivity-87.50% ; specificity-72.73%)
Biopsy (sensitivity-100%; specificity- 100%)

11. Johnson A et al 2019
Fluorescence (sensitivity-100%; specificity- 80%)
Biopsy (sensitivity-100%; specificity-100%)

HIGH-RESOLUTION MICROENDOSCOPE (HRME)

1. Pierce C M et al 2012
Autofluorescence imaging (AFI) &
HRME (sensitivity- 95%;specificity-98%)
Biopsy (sensitivity- 100%; specificity-100%)

2. Quang T et al 2017
Autofluorescence imaging (AFI) &
HRME (sensitivity-72.8%;**specificity-100%**)
Biopsy (sensitivity- 100%; specificity-100%)

3. Jo A J et al 2018
Endogenous Fluorescence Lifetime imaging
(sensitivity-95%; specificity-86%)
Biopsy (sensitivity- 100%; specificity-100%)

4. Yang C E et al 2018
HRME (sensitivity- 91%; specificity-93%)
Biopsy (sensitivity-100%; specificity-100%)

5. Yang C M et al 2020
Multimodal optical imaging (sensitivity- 75%)
Biopsy (sensitivity-100%)

NARROW BAND IMAGING (NBI)

1 . Yang W S et al 2012
Narrow band imaging
(sensitivity- 84.62%; specificity-94.56%)
Biopsy

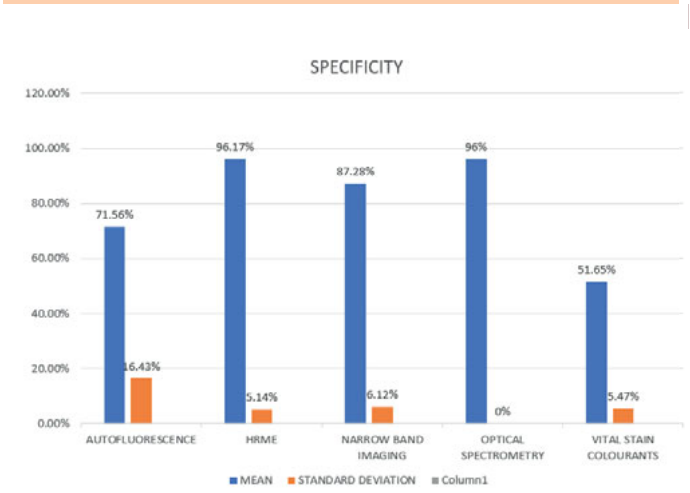
2. Upadhyay A et al 2019
Narrow band imaging
(sensitivity- 93.93%; specificity-80%)
Biopsy

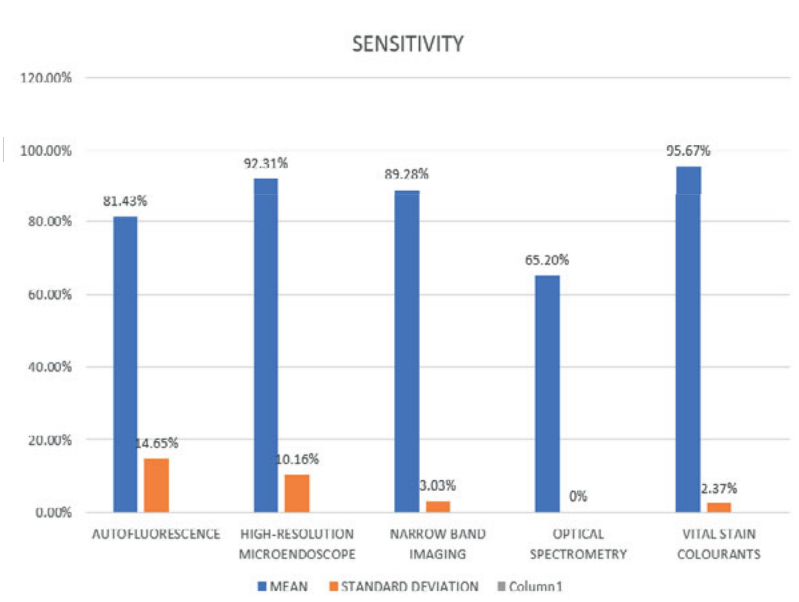
OPTICAL SPECTROMETRY

1. Jayanthi L J et al 2011
Optical spectroscopy (**sensitivity-98.5%; specificity-96%**
2. Murdoch C et al 2014
Optical spectroscopy (sensitivity-65.2% : specificity-62.5%)

VITAL STAIN COLOURANTS

1.Nagaraju K et al 2010
Toluidine blue (**sensitivity-100%; specificity-60%)**
2. Guneri P et al 2011
Toluidine blue (sensitivity-92.3%; specificity-43.3%)
3. Prajeesh M K et al 2019
Toluidine blue (sensitivity-96.4%)
4. Qaiser D et al 2020
Fluorescein dye (**sensitivity-95%**)





DISCUSSION

In the **autofluorescence group**, the study by Rana et al. showed 100% sensitivity, but specificity was 74% . It concluded that Velscope cannot replace biopsy. The 2018 study by **Canjau S et al.** showed 100% specificity for velscope, demonstrating its usefulness in guiding the biopsy. The studies by **Yang et al.** reflected that **multimodal optical imaging** as an emerging technology that requires further elucidation of its role in **patient care** and **randomized studies** with **larger sample sizes**. In the optical subgroup study by **Jayanthi et al**. showed sensitivity of 98.5% and specificity of 96%. In the 2010 study by **Nagaraju K et al.**, Toluidine blue showed a sensitivity of 100% and specificity of 60% in diagnosing OPMDs. **Fluorescein dye** in the study conducted in 2020 by **Qaiser et al.** showed 95% sensitivity. Mean sensitivity was the **highest** for vital stain colourants **(95.6%)** while mean specificity was **highest** for high-resolution microendoscope.

CONCLUSION None of the analysed techniques based on assessing oral images can **replace biopsy**, that remains the gold standard in the diagnosis of OPMDs and OSCC. Further research is needed to explore the role of techniques based on artificial intelligence and imaging analysis to identify an early noninvasive screening method.

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