



# Evaluation of erythema index in denture stomatitis by imageJ software

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## Background

Losing teeth early is still one of the main dental health problems in Thai population. There are many methods for teeth replacement and removable denture is the most common one. Since the denture is inexpensive comparing to dental implant, it is more affordable to Thai patients. However, wearing denture all the time and not cleaning denture regularly can cause inflammatory of oral mucosa at denture bearing area, especially at palatal and gingival mucosa that is in direct contact with the denture base. This is called "Denture Stomatitis".

Visual inspection is a regular method to determine the erythema areas of lesions and their progression. However, the digital technologies are widely spread to all medical fields including dentistry; digital photography is one of them. It can be used in various ways such as providing information for diagnosis and treatment plan, documentation in patients' record and assisting in communication with patients. The photographic information can also be utilized by the use of ImageJ software in order to provide analytic data. This method enables clinicians to analyze image of denture stomatitis, comparing the healing between first and follow up visit, which could provide objective evaluation.

## Objective

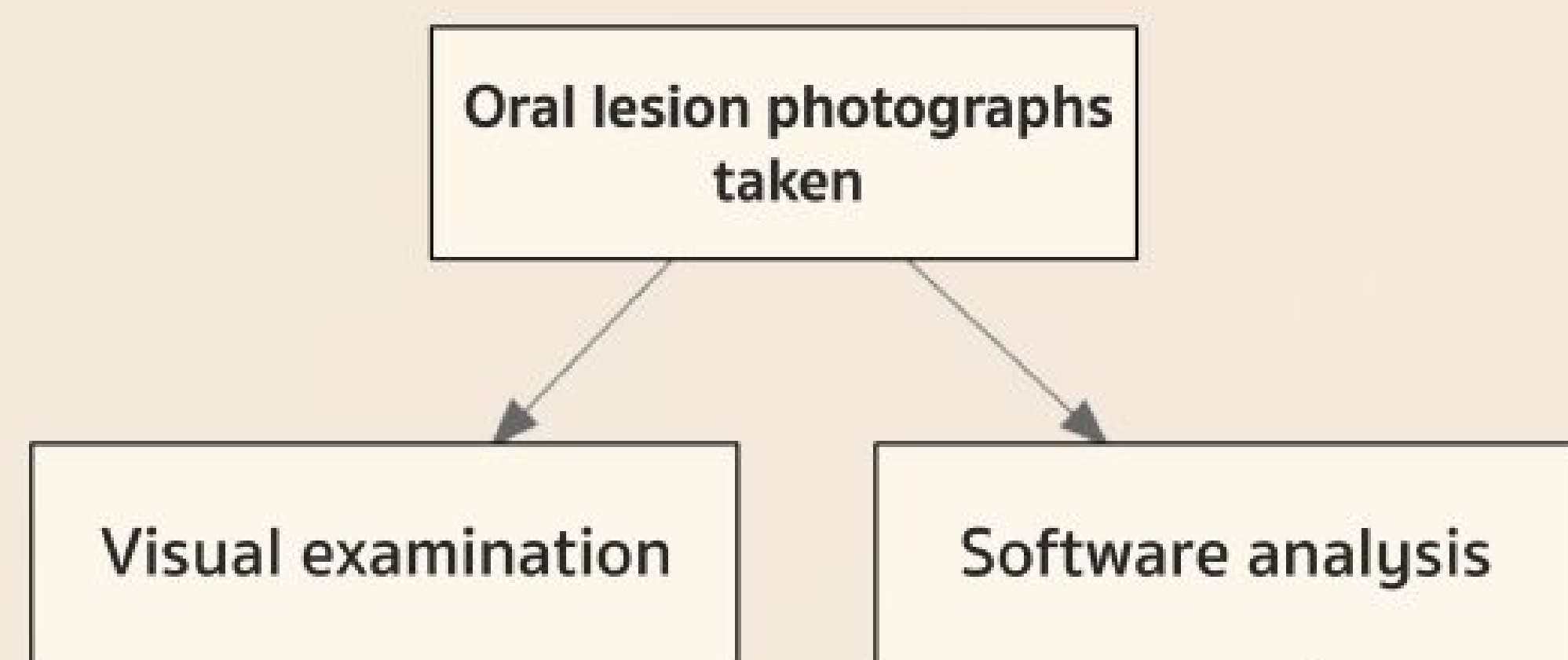
To compare the degree of erythema progression of denture stomatitis by visual inspection and ImageJ software.

## Material & Methods

Samples for this study consisted of palatal lesion of denture stomatitis cases (18 cases; 41 sets of photograph). Digital photographs were taken in all subjects.

The percentage of lesion's redness was observed visually by examiners and analyzed by using Image program analysis (ImageJ). These two results were then compared.

Intra- and inter-observer agreement (absolute agreement or 95% Limits of Agreement) and reliability (Cohen's Kappa) were used to evaluate the visual and ImageJ assessment of palatal erythema. The data were analyzed by the statistical program SPSS version 22.0 for Windows 10.0. (SPSS, Inc., Chicago, IL, USA)



## Results

| Visual Examination         | Kappa value |
|----------------------------|-------------|
| Examiner #1 VS Examiner #2 | 0.459       |

Figure 1. Kappa value comparing redness progression of visual results from different examiners

| Image J Program               | Kappa value |
|-------------------------------|-------------|
| Examiner #1 VS Examiner #2    | 0.892       |
| Dental student VS Examiner #1 | 0.892       |
| Dental student VS Examiner #2 | 0.783       |

Figure 2. Kappa values comparing redness progression using ImageJ program from different examiners

From the data obtained in this analyses, a total of 41 sets of photographs were used. Figure 1 shows the degree of agreement between two examiners in detecting the redness progression by visual examination. Figure 2 shows the degree of agreement between using ImageJ program from different examiners in detecting redness progression. The Kappa values summarized as followed; 0.459 for visual examination, 0.892, 0.892, and 0.783 for using ImageJ program respectively ( $p < 0.05$ ).

According to the results, both observers showed moderate agreement in detecting the changes in progression of redness. On the other hand, redness progression detected from using ImageJ software by different examiners shows almost perfect agreement. This implies that ImageJ software has sufficient reliability in terms of detecting changes in progression of the degree of redness of the lesion.

## Conclusion

The evaluation of denture stomatitis progression can be provided by the use of ImageJ software, which can be used as an assessment tool for easing communication between clinicians objectively and enables clinicians to determine lesion's treatment progression. However, usage of the software may be limited in some cases due to variations of anatomy of the selected area. To establish the erythema index, future studies should be done by trying with other software.

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