The benefits of early mouth cancer screening with tissue autofluorescence visualisation technology

Nichola Tong introduces the benefits of autofluoresence visualisation (AFV) as an adjunctive tool for mouth cancer screening

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The most recent UK statistics show that 11,449 new cases of head and neck cancer are diagnosed every year, with over 2,000 lives lost per year in the UK (www.mouthcancer.org; www.cancerresearch.org). This is more than lives lost in road traffic accidents, testicular cancer and cervical cancer combined (www.mouthcancer.org). Diagnoses of mouth cancer have risen by 30% since the 1990s and it is predicted that incidences will rise by another 33% by 2035.

Early detection of mouth cancer can result in a survival rate above five years of 90%, while a delayed diagnosis can reduce the survival rate to below 50%. In 2012 the General Dental Council added 'oral cancer: early detection' as a recommended CPD subject, saying that it is important for clinicians to remain current in this subject for the sake of patient safety (www.bsom.org.uk). The gold standard of mouth cancer screening is a comprehensive set of checks both extraorally and intraorally undertaken at each dental examination.

A thorough, quick and standardised eight-point screening protocol is available from the Mouth Cancer Foundation (www.mouthcancerfoundation.org). The Mouth Cancer Foundation also advocates the use of adjunctive screening tools which can include chemo luminescence, autofluorescence visualisation (AFV) and brush biopsies although the foundation offers no preference or endorsements.

Evidence

AFV can be dated back to 1924 for its potential in cancer detection and has been the subject of discussion and research papers for several decades. Fluorescence works on the principle that abnormal and pathologically altered tissues will absorb and reflect light at a different wavelength to healthy unaltered tissues.

AFV works when light at wavelengths between 375 and 490nm, the visible blue spectrum, is used to excite fluorophores within oral tissues. Healthy tissues will fluoresce with a pale green light at 515nm when viewed through a narrowband filter (which filters out unwanted detail), whereas potentially malignant or abnormal tissues will not fluoresce and appear as dark areas.

Current paper review

One of the most current papers testing efficacy of light-based detection systems is a systematic review by Nagi et al (2016). The review used 20 English language primary studies dating from 2005 to 2014 and concluded that AFV can help clinicians to identify premalignant and malignant lesions and can more accurately define the borders of true malignancies versus naked eye detection alone.

A non-randomised multicentre study by Moro et al (2015) tested the efficacy of Goccles for identifying OSSC and dysplasia with AFV and this is the only study to test Goccles due to its relative newness to the market. Moro et al also concluded that AFV is a useful adjunct to conventional screening methods and can detect invisible malignancy.

Important summary

The summary of both papers can be concluded that AFV is a useful adjunct to conventional mouth cancer screening because it can find lesions undetectable to the naked eye, can identify pre and malignant changes, and can help to define the borders of true malignancies giving a high sensitivity rate.

Both papers concluded that AFV cannot differentiate dysplasias and malignancies from benign inflammatory conditions giving a low specificity rate. It can be said that an experienced clinician and with adequate training in using AFV could differentiate one from another in many cases.

Conclusion

The most recent publication is by Huang et al (2017), which offers a quantitative analysis of autofluorescent images for oral cancer screening. Due to research limitations, only the abstract was available for this article. The researchers reported a high specificity and high sensitivity rate of AFV to detect pre and malignant lesions from normal mucosa but concluded that the skill of the clinician will determine its accuracy, which supports the previous papers.

A local influencing factor to take in to consideration when using either system is the ability to shut out ambient light

All historical papers researched for this article conclude that AVF has a place when screening or oral cancer in conjunction with conventional methods.

However, its role as a singular diagnostic tool is yet to be achieved and research is currently ongoing for diagnostic usefulness. AFV has attracted attention from the UK National Screening Committee and further information of the literature search, including a Cochrane review, can be found in the NHS Appraisal of Screening for Oral Cancer report (2015).

Goccles versus Velscope

Goccles were created to provide a low cost direct fluorescence visualisation of oral soft tissue abnormalities and were introduced to the consumer market in 2015 (Moro et al, 2015). Other existing auto fluorescent technology available includes the Velscope and neither device requires the use of rinses or dyes to accentuate potential abnormalities. Based on Nichola's use of both systems as an adjunctive screening tool, this section of the article will highlight the difference between the two devices and offer a subjective opinion of the benefits of Goccles versus Velscope.

The Goccles device is a modern, stylish pair of glasses as opposed to a heavier, bulkier, and noisy hand-held device such as Velscope.

Velscope has its own built in tungsten halogen light source which passes electricity over a tungsten filament and gets very hot very quickly. This design means the device needs to be charged frequently and also needs an in built cooling fan. This accounts for the bulky, noisy features of this device.

By contrast, Goccles works together with any dental curing light, most of which are LED, cordless, silent and don't create heat therefore making them lighter and more portable. Goccles are packaged in a small protective case,

which make them easy to transport if working in multiple locations. Velscope requires a continued supply of disposable, single-use narrow band filters whereas Goccles' design has the narrow band filter built in meaning that running costs are zero following purchase. A consideration when using Velscope is the potential to get too close to the patients' face due to the prominence of its design, whereas Goccles sit snugly against the users face and still afford peripheral and spatial awareness.

A local influencing factor to take in to consideration when using either system is the ability to shut out ambient light. The darker the environment when using AFV means better reflected fluorescence.

The only benefit of Velscope over Goccles, according to the author, is that halogen has a higher intensity light than LED and so is not quite so sensitive to ambient light.

Conclusion

It seems that AFV is a promising adjunct to a thorough extra and intraoral screening protocol for mouth cancer and has the ability to detect visible and invisible tissue abnormalities. Goccles provides a more modern, streamlined and cheaper method of harnessing the value of tissue autofluorescence when screening for mouth cancer. This type of adjunctive screening method could assist the clinician to comply with the GDC's call for early detection and could potentially save lives. **D**

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