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RESEARCH ARTICLE

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GRID COUNTING: A NOVEL AND OBJECTIVE ASSESSMENT TECHNIQUE

ABSTRACT

Efficiency of periodontal instrumentation has been assessed using indices like remaining calculus index, roughness and loss of tooth substance index which are very subjective. We hereby propose a more reproducible and objective technique for assessment of root surface components like calculus, tooth structure loss etc. Grid Counting Technique, is based on the point counting, which has been proven to be efficient in objectively grading area fractions in microscopic assessment of mitosis, immunohistochemistry as well as radiographic valuation. The implementation of the technique in relevant areas of periodontal research would enable a reliable comparison between multiple studies.

KEY WORDS Point counting technique, Area Fractions, Remaining calculus index, Periodontal Instrumention.

INTRODUCTION

Periodontal health is gaining importance in the present day world. Newer instruments and procedures, advanced ultrasound scalers, lasers, tooth cleansers etc., are finding its use in periodontal procedures day by day.[1] One of the targets of periodontal research is to find an ideal instrument which can effectively clean the tooth surface of deposits with minimal host tissue damage. Instruments used to prepare root surfaces mechanically of debris/calculus should not excessively damage, gouge, trough, or remove injudicious amounts of root structure. The operational efficacy of a periodontal instrumentation is assessed predominantly by evaluating the remaining calculus and the loss of tooth structure.[2,3] The grading system used (table 1) by previous studies are very subjective and exhibit a high inter- as well as intra-observer variability.[3]

To bring in more objectivity in the grading system a modified point counting system can be employed. Point counting system has long been used for assessing the percentage area or relative fraction of a microscopic component and is effective in assessing mitotic load, amount of keratin ,tumour fraction (in histology, MRI), etc.[4,5]

MATERIALS AND METHODS

The technique is described to assess the remaining calculus or tissue damage following instrumentation, which can be modified for assessment of other parameters also.

- The concerned area of examination is photographed including a scale. The photograph may be of a gross, stereo microscopic image or electron microscopic image.
- The area of examination (e.g. root surface) is overlapped by a grid. The width of the grid is determined by the investigator based on the availability of time and the accuracy of the result. We must however, remain cognizant that the width of the grid once fixed must remain same for all the samples being examined. (Roughly a 0.5 mm grid overlap for a gross examination of the whole root gives adequate results.) The grid overlap tool is available with the any image analysis software (e.g. Image J, a JAVA based freely available software for image analysis) which lets the user choose the width of the grid. (figure 1)
- The relative ratio is then calculated as, the ratio of the number of grids containing the component of examination (calculus/loss of tooth structure) to the grids containing the primary structure (tooth/root). The grid count is considered valid only when the

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component under observation (calculus/tooth/Cementum) is more than half of the grid area. This prevents the urge to give over importance to a field of interest in the grid section. (figure 1)

- The ratio can then be tabulated for all the specimens/ photographs for statistical analysis.

For example in figure 1, the aim is to assess the amount of calculus on the root surface. The number of grids containing calculus is 15 and Number of grids showing the root =21. Relative percentage of calculus = (15×100)/21 = 71.4% of root covered by calculus.

RESULTS AND DISCUSSION

The above described technique gives a more objective score of the component under examination, thus facilitating comparison of studies conducted in various setups. This technique can be extended for the examination of the scanning electron microscopic images, teeth stained with vital stains etc.

CONCLUSION

The grid counting technique may thus prove to be a more reliable and efficient assessment technique, and we recommend its use to get more reproducible and comparative scores.

Remaining Calculus Index	Roughness and loss of tooth substance index
0- No calculus remaining on the root surface 1- Small patches of extraneous material probably consisted of calculus 2- Define patches of calculus confined to small areas 3- Considerable amounts of remaining calculus appearing as one or a few voluminous patches scattered on the treated surface	0- Smooth and even root surface without marks from the instrumentation and with no loss of tooth substance. 1- Slightly roughened or corrugated local areas confined to the cementum 2- Definitely corrugated local areas where the cementum may be completely removed, although most of the cementum is still present 3- Considerable loss of tooth substance with instrumentation marks into the dentin. The cementum is completely removed in large areas, or it has a considerable number of lesions from the instrumentation

TABLE 1. Currently used indices for root surface assessment[3]

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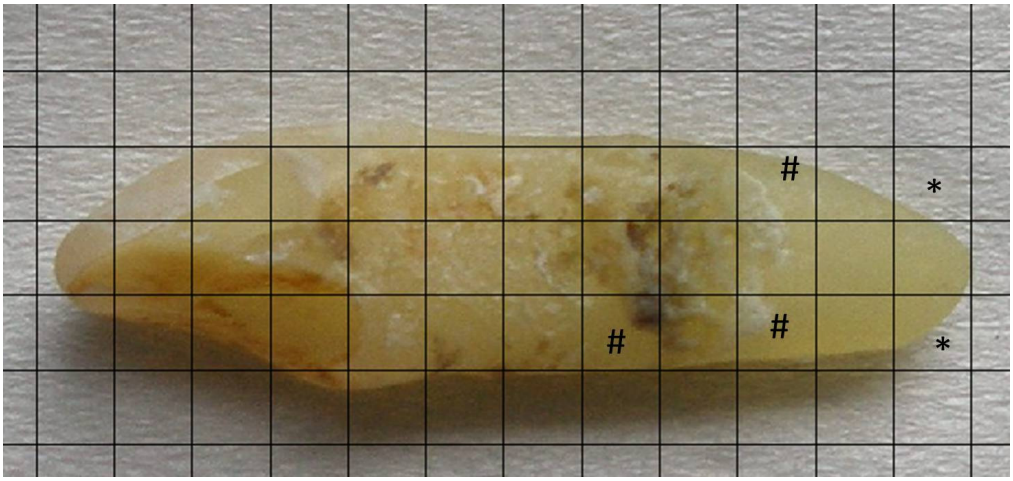
FIGURE 2



Grid overlapped over the tooth to be examined.

- the area calculus component is less than ½ the grid area thus is excluded.

* - the tooth component is less than ½ grid area thus is excluded.

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