Journal of Oral and Maxillofacial Surgery, Medicine, and Pathology 31 (2019) 52–58

Contents lists available at ScienceDirect

Journal of Oral and Maxillofacial Surgery, Medicine, and Pathology

journal homepage: www.elsevier.com/locate/jomsmp

# MCM-2 an alternative to Ki-67 for assessing cell proliferation in odontogenic pathologies

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ARTICLE INFO

*Keywords:*
Ki-67
MCM-2
Ameloblastoma
Odontogenic keratocyst
Proliferative index

ABSTRACT

*Objective:* New proliferative marker MCM-2 can be observed in all phases of cell cycle and plays a central role in chromatin replication. At present limited information exists on the expression of MCM-2 in odontogenic pathologies (OP). Hence, the purpose was to assess the expression of Ki-67 and MCM-2 in clinically significant OP and to evaluate the relation between these markers and the clinical-imaging-pathologic characteristics of ameloblastoma (AM) and odontogenic keratocyst (OKC).

Materials and Methods: Clinical-imaging-pathologic characteristics of thirty consecutive cases of AM and thirty OKC were tabulated and sections were subjected to immunostaining for Ki-67 and MCM-2. The quantitative data was subjected to One Way Anova, Tukeys multiple posthoc procedures, independent *t*-test, paired *t*-test and Pearson's correlation test.

*Results:* Proliferative index (PI) was significantly higher with MCM-2 than Ki-67 in AM and OKC. PI with Ki-67 and MCM-2 in AM was significantly higher in peripheral than the central cells. PI with Ki-67 and MCM-2 in OKC was significantly higher in suprabasal than the basal cells. PI with Ki-67 or MCM-2 in AM and OKC did not show a statistically significant difference. MCM-2 in AM showed a significant association with type of radiolucency and nature of lesion. Ki-67 in OKC showed a significant association with number of lesion and type of radiolucency.

*Conclusions:* MCM-2 is a more sensitive marker for assessing the growth rate, and may be appropriate in sorting the proliferative fraction than Ki-67. Comparable expression of proliferative markers in AM and OKC clarifies their nature, indicating identical aggressive character.

## Introduction

"Proliferative markers" (PM) refer to precise proteins in actively growing and dividing cells, whose presence serves as a pointer for such cells [1,2]. The recognition of the proliferative activity (PA) in pathologies may be valuable to predict the biologic demeanor of the different lesions [3]. A number of classical molecular PM, including Ki-67, PCNA, Cyclin D1 and DNA topoisomerase II alpha have been studied to characterise odontogenic pathologies (OP) [1]. The efficacy of new PM like Minichromosome Maintenance Complex (MCM complex), Geminin and Mitosin have been analyzed in diverse neoplasms, and their value in OP are hardly explored and currently reports demonstrating their usefulness in clinically significant odontogenic lesions are barely any [1].

In new growths, an abnormal and uninhibited proliferation of cells is noted, and the cell cycle is altered. The fact that the Ki-67 being in all active phases of the cell cycle but is absent from resting cells makes it an excellent operational marker for determining the growth fraction (GF) of a given population and is considered the gold standard for the evaluation of PA [4]. However, it is apparent that estimating the GF only is inadequate to explain new growth. The assessment of the GF offers information only on the state but not on the pace of proliferation. A supplementary marker would be useful to gauge this parameter [2].

MCM proteins form a hetero hexameric ring of MCM-2–MCM-7 complexes that act as replicative DNA helicase. They are involved in the initiation and regulation of DNA replication. MCM 2–7 proteins are structurally similar to each other and have similar action mechanisms. In the cell cycle, levels of the MCM family steadily increase in a variable manner from Go into G1/S phase. MCM is a Go/G1/S/G2/M-phase marker and is also necessary for entry into S phase and cell division. MCM are present only during the cell cycle and vanish from the cell in quiescence and differentiation [1,5,6]. Several studies associate MCM2–MCM7 complex proteins with cell growth assessment [6,7].

MCM-2 is a member of the MCM protein family that plays an

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https://doi.org/10.1016/j.ajoms.2018.10.002
Received 3 September 2018; Received in revised form 10 October 2018; Accepted 25 October 2018
Available online 30 October 2018