

## Original Research Article

**Importance of degranulated mast cells in oral pyogenic granuloma**Dr. B. Rajsekhar<sup>1</sup>, Dr. Murali.R<sup>2</sup>, Dr. Sabitha Devi.R<sup>3</sup>, Dr. Gurmeet singh<sup>4</sup><sup>1</sup>Associate Professor, Department of Pathology, P.K.Das Medical College, Ottapalayam, Kerala<sup>2</sup>Prof &HOD, Dept of oral pathology, Best dental science college, Madurai<sup>3</sup>Reader, Dept of Oral pathology, SJDC, Eluru<sup>4</sup>Assistant Professor, Dept. of pathology, Solan medical college, Himachal Pradesh**\*Corresponding author**

Dr. B. Rajsekhar

Email: [drsrpath@gmail.com](mailto:drsrpath@gmail.com)

**Abstract:** Mast cells (MCs) are large granular mononuclear cells which are bone marrow derived, they are found in different tissues and also they can move. Degranulation of MCs is caused by various stimulus. Oral pyogenic granuloma is a recognized oral lesion that possibly originate as a response of tissue, it is suggested that local factors can activate MCs resulting in mediators releases that finally bring about pyogenic granuloma. This study was aimed at determining the average intact and degranulated mast cell count in oral pyogenic granuloma. 50 paraffin blocks of oral pyogenic granuloma was selected. Slides stained with 1% toluidine blue were prepared and MCs numbers were studied with light microscope. The average numbers of total and degranulated MCs were calculated 11.87 and 9.62 respectively. The percent of degranulated MCs was measured about 80%, this finding is really remarkable and can introduce MCs as an effective factor in the pathogenesis of oral pyogenic granuloma. By mast cells careful considerations, it seems that pyogenic granuloma represents a reactive lesion resulting from local etiological factor like gingival inflammation, calculus or trauma which activate mast cells leading release of mast cell mediators which further results in subsequent changes in the tissue leading to formation of pyogenic granuloma.

**Keywords:** Mast cell, oral pyogenic granuloma, toluidine blue, degranulated

**INTRODUCTION**

Mast cells have been described for the first time by Ehrlich in 1878. He used the term “mastzellen,” a German term that refers to feeding, in order to describe these cells. Ehrlich also noted the association between mast cells and inflammation, blood vessels, and nerves. Mast cells are found in all connective tissue types of the oral cavity, including the periodontal ligament, the dental pulp, and the gingiva. Mast cells have been associated with a wide range of oral affections, such as periapical lesions, gingivitis, odontogenic cysts, pyogenic granulomas, and lichen planus [1]. Mast cells (MCs) are large elliptical or spherical mononuclear cells [18]. They are bone marrow derived; usually containing 80-300 granules and also can move [2].

Mast cell granules contain a great variety of mediators, which may be grouped into two categories: preformed and de novo. Preformed mediators are represented by tryptase, chymase, cathepsin G, histamine, heparin, serotonin, IL-16, and TNF- $\alpha$ .

Mediators synthesized following mast cell activation are represented by interleukins IL-1, IL-3, IL-4, IL-5, IL-6, IL-8, IL-10, IL-13, and IL-16, platelet activating factor (PAF), RANTES, MIF-1 alpha (macrophage inhibitory factor) and arachidonic acid metabolites, prostaglandin, and leukotriene C4 (LTC4) [1].

Mast cells degranulation cause release of pro-inflammatory mediators like: TNF- $\alpha$  (TNF- $\alpha$ ), chymase, tryptase, MMPs, bFGF, heparin, histamine, various interleukines and cytokines RANTES. RANTES secreted by activated T cells attract mast cell and stimulates degranulation [3]. Degranulation of mast cells is caused by various stimuli such as IgE receptors, neuropeptides (substance P), chemokines and other physical stimulus [2].

There is a belief that MCs in oral tissues release various pro-inflammatory cytokines and tumor necrosis factor (TNF- $\alpha$ ) that promote leukocytes infiltration; also mast cell secrete proteases activate matrix – metalloproteinases -9(MMP-9) which may

have a role to alteration in basement membrane in inflammatory conditions [4].

Pyogenic granuloma is a recognized oral lesion and its occurrence in man was first described in 1897 by Poncet and Dor [5]. Oral pyogenic granuloma comprises about 1.85 % of all oral pathoses [6] and known to involve the gingiva commonly, It is suggested that this lesion possibly originate as a response of tissues to minor trauma and or chronic irritation [5]. Local factors for example calculus, gingival inflammation or trauma can activate MCs resulting in mediators' release that promotes inflammatory and vascular changes and finally bring about pyogenic granuloma [4].

This study was aimed at determining the average intact and degranulated mast cell count in oral pyogenic granuloma, based on the theory that degranulated MCs can play causative role in the pathogenesis of pyogenic granuloma.

#### MATERIALS AND METHODS

The present study was conducted on 50 paraffin blocks with oral pyogenic granuloma .Two sections was prepared from each block : one stained with H&E for confirmation of diagnosis and one stained with toluidine blue(Merck, Germany) for mapping of mast cells. Slides of pyogenic granuloma were then subjected to microscopic assessment.

Two morphological types of mast cells recognized in TB stained sections:

1. *Intact MCs* with dark blue or purple color, these cells did not show any sign of degranulation.
2. Degranulated mast cells that had more extruded metachromatic visible granules .In this type of MCs partial or perfect disintegration of original cell outlines was presented.

Mast cell counting: In the 5 high power fields of each section of pyogenic granuloma degranulated, intact and total numbers of MCs were counted fewer than 40X magnification, and it was done with enough attention not to overlap mast cell count [7]. Results were expressed as the average number of mast cells per high power field.

#### RESULTS

Out of 50 cases of oral pyogenic granuloma, 80 % of occurrence was observed in the 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> decade with a female predilection of 3:1. All of cases occurred on gingiva. In the pyogenic granuloma, the average number of total and degranulated mast cells per high power field was calculated 11.87 and 9.62, respectively the percent of degranulated mast cells was measured about 80%.

#### DISCUSSION

Pyogenic granuloma still has a questionable pathogenesis, whether this lesion demonstrates a benign neoplasm, a reactive lesion or an infection process remains vague [8].

Increasing in average mast cell count in inflammatory reactive situations like granulation tissue , gingivitis ,inflammatory hyperplasia [9] also in vascular condition like hemangiomas [10] states that MCs can have an effective role in recruitment of inflammatory cells and angiogenesis ; as well as mast cells degranulation sets free performed granules including mediator like tumor necrosis factor, histamine, serotonin and numerous proteases responsible for most of the mast cell dependent functional responses[11], thus determining whether mast cells are degranulated or intact may be a good marker to evaluate whether MCs are including in a practical process or not [8].

Juneja *et al.*; found that in oral lichen planus about 60% of mast cell were degranulated which considered an important source of chymase and tryptase, which are MMP 1,3 and 9 activator proteases [12].

Gomes *et al.*; suggested that MCs count increases in neoplasms and ultraviolet irradiated skin, in 4 group in their study including normal oral mucosa, actinic cheilitis with mild dysplasia, actinic cheilitis with severe dysplasia and lip squamous cell carcinoma, the most number of MCs related to lip SCC and followed by actinic cheilitis with mild dysplasia [13].

Ghalayani *et al.*; showed that the degranulated mast cell, ratio of degranulated mast cell and TNF- $\alpha$  positive degranulated mast cell in oral lichenoid reaction were significantly higher than oral lichen planus and therefore these may be able to be used as diagnostic markers to the differential diagnosis of OLP and OLR [14].

Kamal et al reported that an increase in the average MCs count and the average number of degranulated MCs in oral pyogenic granuloma in comparison with normal oral mucosa was observed [8]. Shea *et al.*; claimed that mast cell play a key role in the pathogenesis of dermal pyogenic granuloma [15]. In our study the percent of average degranulated MCs was calculated about 80% that could be completely significant. This finding can confirm the results of previous studies [8, 15]. And introducing MCs as an effective factor in the pathogenesis of oral pyogenic granuloma.

Mast cells are sensitive to neuropeptides and through their interaction with neural elements, construct a neural immune network with Langerhans cells in mucosal tissue. This makes mast cell degranulation easier in reaction to various etiological factors. Further, on degranulation process, mast cells set free a range of pre-formed mediators and these mediators eventually lead to inflammatory and vascular changes in pyogenic granuloma [16]. Spoorthi *et al.*; studied MCs count in oral inflammatory lesion including inflammatory hyperplasia, pyogenic granuloma and periapical granuloma, they reported the most average MCs count was related to inflammatory hyperplasia [17].

By mast cells careful considerations, it seems that pyogenic granuloma represents a reactive lesion resulting from local etiological factor like gingival inflammation, calculus or trauma which activates mast cells leading release of mast cell mediators which further results in subsequent changes in the tissue leading to formation of pyogenic granuloma [18].

#### REFERENCES

1. Gaje PN, Amalia Ceausu R, Jitariu A, Stratul SI, Rusu LC, Popovici RA, Raica M. Mast Cells: Key Players in the Shadow in Oral Inflammation and in Squamous Cell Carcinoma of the Oral Cavity. *BioMed Research International*. 2016 Oct 26; 2016.
2. Walsh LJ. Mast cells and oral inflammation. *Critical reviews in oral biology & medicine*. 2003 May 1; 14(3):188-98.
3. Souza Freitas V, de Andrade Santa PP, de Almeida Freitas R, Pereira Pinto L, de Souza LB. Mast cells and MMP9 expression in actinic cheilitis and lip squamous cell carcinoma. *Oral Surg Oral Med Oral Pathol Oral Radiol Endol* 2011; 112: 342-8
4. Kheur S, Patekar D, Bagul N, Kulkarni M, Routray S, Dhas V. ROLE OF MAST CELL IN ORAL PATHOLOGY. *Oral & Maxillofacial Pathology Journal*. 2013 Jan 1; 4(1).
5. Kamal R, Dahiya P, Puri A. Oral pyogenic granuloma: various concepts of etiopathogenesis. *Journal of oral and maxillofacial pathology*. 2012 Jan 1; 16(1):79.
6. Bhaskar SN, Jacoway JR. Pyogenic granuloma--clinical features, incidence, histology, and result of treatment: report of 242 cases. *Journal of oral surgery (American Dental Association: 1965)*. 1966 Sep; 24(5):391-8.
7. Jahanshahi G, Aminzadeh A. A histochemical and immunohistochemical study of mast cells in differentiating oral lichen planus from oral lichenoid reactions. *Quintessence International*. 2010 Mar 1; 41(3).
8. Kamal R, Dahiya P, Palaskar S, Shetty VP. Comparative analysis of mast cell count in normal oral mucosa and oral pyogenic granuloma. *Journal of Clinical and Experimental Dentistry*. 2011; 3(1):1-4.
9. Klatt EC, Lukes RJ, Meyer PR. Benign and malignant mast cell proliferations: Diagnosis and separation using a pH-dependent toluidine blue stain in tissue section. *Cancer*. 1983 Mar 15; 51(6):1119-24.
10. Hagiwara K, Khaskhely NM, Uezato H, Nonaka S. Mast cell "densities" in vascular proliferations: a preliminary study of pyogenic granuloma, portwine stain, cavernous hemangioma, cherry angioma, Kaposi's sarcoma, and malignant hemangio endothelioma. *The Journal of dermatology*. 1999 Sep 1; 26(9):577-86.
11. Krishnaswamy G, Kelley J, Johnson D, Youngberg G, Stone W, Huang SK, Bieber J, Chi DS. The human mast cell: functions in physiology and disease. *Frontiers in bioscience: a journal and virtual library*. 2001 Sep; 6:D1109-27.
12. Juneja M, Mahajan S, Rao NN, George T, Boaz K. Histochemical analysis of pathological alterations in oral lichen planus and oral lichenoid lesions. *Journal of oral science*. 2006; 48(4):185-93.
13. Gomes AP, Johann JE, Lovato GG, Ferreira AM. Comparative analysis of the mast cell density in normal oral mucosa, actinic cheilitis and lip squamous cell carcinoma. *Brazilian dental journal*. 2008; 19(3):186-9.
14. Ghalayani P, Jahanshahi G, Saberi Z. Degranulated mast cells and TNF- $\alpha$  in oral lichen planus and oral lichenoid reactions diseases. *Advanced biomedical research*. 2012; 1.
15. Shea CR, Prieto VG. Mast cells in angio lipomas and hemangiomas of human skin: are they important for angiogenesis?. *Journal of cutaneous pathology*. 1994 Jun 1; 21(3):247-51.
16. Walsh LJ, Davis MF, Xu LJ, Savage NW. Relationship between mast cell degranulation and inflammation in the oral cavity. *Journal of oral pathology & medicine*. 1995 Jul 1; 24(6):266-72.
17. Spoorthi BR, Vidya GS. Mast cell count analysis in oral inflammatory lesions, potentially malignant disorders and oral squamous cell carcinomas. *International Journal of Scientific and Research Publications*. 2013; 3(12):1-4.
18. Mahadesh J. Mast Cell, the major blaster: an overview. *Annals and Essences of dentistry* 2011; 111:130-33.