IJPRP

Indian Journal of Pathology: Research and Practice 8(3) May - June 2019
DOI: http://dx.doi.org/10.21088/ijprp.2278.148X.8319.1

Original Research Article

Study of Mast Cells in Different Pathological Conditions of Surgically Resected Appendix

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Received on 11.04.2019,

Accepted on 30.04.2019

Abstract

Mast cells arise from the hemopoietic progenitor cells of the bone marrow derived and were first discovered by Paul Ehrlich in 18th century. They are found in varying numbers in different tissues and are abundant near blood vessels, nerves and in subepithelial tissues. They are constantly present in appendix, the organ most commonly subjected for surgical intervention and removal. The present study was undertaken 1) To compare the mast cell counts in the mucosa, sub mucosa and the muscular layers of the appendix. 2) To compare the mast cell counts in the normal appendix and in the acute, recurrent, and chronic appendicitis in various age groups. *Materials and Methods:* seven hundred and seventy-seven cases of appendix were evaluated for histopathological changes and number of mast cells in each layer. The mast cell count in various histopathological group were compared using ANOVA (DUNNETT) Test. The degree of mast cell density was evaluated using Pearson's correlation test. Result: A higher mast cell count was seen in acute eosinophilic appendicitis and recurrent appendicitis. Mean mast cell counts were high in recurrent appendicitis with fibrosis, when compared with no fibrosis. *Conclusion:* Mast cell activation is one of the important factors in causation of appendicitis and thus this activation of mast cells backs the allergic theory of appendicitis.

Keywords: Mast cells; Appendix; Appendicectomy.

How to cite this article:
Ashwini Kolur, Ashok M Patil, Saeed Yendigiri. Study of Mast Cells in Different Pathological Conditions of Surgically Resected Appendix. Indian J Pathol Res Pract. 2019;8(3):251-253.

Introduction

Mast cells are highly engineered cell, originating from the hemopoietic tissue in the bone marrow. They are widely found in the body, particularly associated with connective tissues and are known to play a role in health and various disease states [1]. Mast cells populate most tissues, but are found in abundance in the skin, airways and digestive tract where they are thought to act as first line of defense

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against infiltrating pathogens and parasites [2] In acutely inflamed tissues decreased number of mast cells have been reported where as it has been observed that increase in number of mast cells at sites of chronic inflammation and fibrosis have been noted [3]. Mast cells are known to play important role in the amplification of acute inflammation of nonimmunologic origin. These cells are important for the induction of aneutrophil influx in immune complex - mediated responses [4]. Mast cells play important role in GIT, they are essential component of the mucosal innate immune response [5]. It is suggested that they are involved in the activation of the mucosal immune system.

One of the most common surgical cause of acute abdomen is Acute appendicitis and it, commonly occurs in adolescents and young adults [6]. The incidences of appendicitis, in developing countries is increasing especially in the urban centers and this might be due to adaptation of western diet. The pathogenesis of appendicitis is very poorly understood. In majority of cases the cause for appendicitis is not known. In a case of appendicitis there can also be a multiple cause. Obstruction in the appendix may cause appendicitis and presently luminal faecoliths is thought to be the most common reason for such obstruction. Obstruction in the appendix can also result from enlarged lymphoid follicles, worms, trauma and tumors [7]. For confirmation of the appendicitis, histopathological examination still remains the gold standard method. The mast cell appears to be one of the important cells responsible for nerve proliferation and hypertrophy in appendicitis [8]. The mast cell counts in the normal appendices are lowest, notably higher in acute appendicitis and the highest count is noted in recurrent appendicitis [6].

The present study was undertaken, to compare the mast cell counts in the mucosa, sub mucosa and the muscular layers of the appendix and to compare the mast cell counts in the normal appendix and in the acute, recurrent, and chronic appendicitis in various age groups.

Materials and Methods

The present study was conducted in the Department of Pathology, Al-Ameen medical college, Bijapur. The material for study consisted of appendix specimens received for histopathological examination. It was 5-year study, 3 years retrospective from May 2007 to May 2010 and 2 years prospective from June 2010 to June 2012. The specimens were analyzed by doing the Hematoxylin & eosin staining, Van Gieson stain and toluidine blue staining. Haematoxylin & Eosin stained sections were studied for various findings of appendicitis including the presence of eosinophils and fibrosis. Van Gieson stain was done to confirm the presence of fibro-collagenous tissue. 1% toluidine blue for the identification of mast cells. The stained sections were studied immediately and photographs were taken. The number of mast cells in the mucosa, submucosa and muscular layer was counted under high power of the microscope. The average count obtained in 10 non-overlapping high-power high fields was considered. The mast cell count in various histopathological group were compared using ANOVA (DUNNETT) Test. The degree of mast cell density was evaluated using Pearson's correlation test.

Results

Seven hundred and seventy-seven cases of appendix were evaluated. Out of those cases studied 392 were females and 385 were males. Maximum cases were noted in the age group of 11–20 age group (43.38%), followed by 21–30 age group (34.55%) and 31–40 age group (9.35%). In younger age group (0–21 years) increased incidence of acute appendicitis was noted and recurrent appendicitis incidence was more in an age group of more than 20 years. In all the layers of appendix, highest mean mast cell count was noted in histopathological group of Acute eosinophilic appendicitis and was statistically significant.

Table 1: Total mean mast cell count in different layers of appendix

Histopathological groups	Layers of the appendix Total mean mast cell count/sq. mm					
	Mucosa		Submucosa		Muscularis Propria	
	Age group (0-20) years	Age group >20 years	Age group (0-20) years	Age group >20 years	Age group (0-20) years	Age group >20 years
Normal	8.4 ± 4	6.15 ± 3	9.2 ± 5.4	7.1 ± 3.8	8.3 ± 4.4	10.3 ± 5.2
Acute appendicitis	8.9 ± 4.2	8.7 ± 4.2	8.5 ± 4.3	8.3 ± 4.6	7.73 ± 3.5	8.6 ± 4
Acute suppurative appendicitis	8.5 ± 4.1	8.1 ± 2.3	7.3 ± 3.5	9.5 ± 6.9	9.6 ± 5.2	8.3 ± 5
Acute eosinophilic appendicitis	15.38 ± 12	24.9 ± 7.9	16.5 ± 12	16.7 ± 14.4	18.2 ± 9.2	13.8 ± 9.2
Recurrent appendicitis	11.4 ± 6.1	11.2 ± 6.1	10.5 ± 6.3	10 ± 5.5	9.9 ± 5.3	10 ± 5.9

Discussion

Appendix once considered as vestigial organ in human beings, presently thought to be probably concerned with establishment and maintenance of the body defence and immunity of the body. like in other studies highest incidences of appendicectomy was noted in females and also highest number of negative appendicectomy was also seen among females [9,10]. In the current study, recurrent appendicitis was seen more frequently than acute appendicitis. The incidence of recurrent appendicitis was higher in the age group above 20 years. In the present study, the incidence of acute appendicitis was found to be 43.5%. A higher incidence of acute appendicitis was seen in the age group below 20 years and in females [11]. In the present study significant increase in mucosal mast cell count was seen in acute eosinophilic appendicitis, followed by recurrent appendicitis. Intermediate counts were seen in mucosa of acute appendicitis and acute suppurative appendicitis, very low mast cell count was seen in normal appendix. Similarly, even in the submucosa, highest mean mast cell count was seen in acute eosinophilic appendicitis followed by recurrent appendicitis and lowest was noted in normal appendix, which was in concordance with many studies [12,13]. There are incidences where mean mast cell counts were decreased in mucosa and submucosal layers of acute appendicitis and it may be due to failure to detect them because of degranulation and elimination through the mucosa [14]. In the muscular layer a higher mast cell count was observed in acute eosinophilic and recurrent appendicitis, compared to normal appendices. In our study there was not much difference between the older and younger age group. There was no correlation of mast cell count and sex. High mast cell count was seen in recurrent appendicitis with fibrosis in all layers as compared to other inflammatory appendices.

Conclusion

Mast cell activation appears to be one of the important factors in the causation of appendicitis thus this activation of mast cells backs the allergic theory of appendicitis.

Acknowledgement

The authors would like to acknowledge the support of the Al Ameen Medical College, Bijapur, Karnataka, India.

Presentation at a meeting: Nil

Conflicting Interest: Nil

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