

Role of Mast Cells in Appendicitis

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ABSTRACT

Aim and objective- 1) To identify and quantify the mast cells in surgically resected inflamed appendices. 2) To assess the role of mast cells in the pathogenesis of acute appendicitis. 3) To evaluate the extent of mast cell involvement in appendicitis

Introduction- Acute appendicitis is a common surgical emergency. Appendix continues to be the major chunk of surgical specimens received in Pathology laboratory. However, pathogenesis of appendicitis remains poorly understood. Mast cells play an important role in various inflammatory and immune reactions. Mast cells could be one of the important cell populations responsible for nerve proliferation and hypertrophy in cases with clinically and histopathologically diagnosed appendicitis.

Materials and Methods- One fifty appendicitis cases were analyzed with routine hematoxylin and eosine staining and other special stains like toluidine blue. The number of mast cells present in ten consecutive high power fields was counted by randomly in all the sections with one percent toluidine blue and graded the mast cells.

Results: Among one fifty cases, the acute appendicitis were fifty five cases (55), with higher mast cell count, acute eosinophilic appendicitis cases were eleven (11) and chronic appendicitis were eighty four cases(84), with highest mast cell count.

Conclusion: We concluded that mast cell count was higher in acute appendicitis indicating immunological and non immunological injury and was highest in chronic appendicitis, indicating growth interaction between mast cells, nerves and fibrosis. Our observations support the allergic theory of appendicitis rather than the obstructive theory.

Keywords: Acute appendicitis, Chronic appendicitis, Mast cells.

INTRODUCTION

Appendicitis is a characterized by inflammation of the appendix. It is classified as a medical emergency if untreated, Mortality is high, mainly because of the risk of rupture leading to peritonitis and shock. Pain from appendicitis can be severe.

The worldwide incidence of appendicitis is estimated to be 86 cases annually/100,000 populations. ^[1] It affects men more commonly than women. The condition is very common between the ages of 10 and 30 years. Despite modern

antibiotics, high-tech diagnostic machines and surgical advances, appendicitis still kills as many as 2,000 people in the India each year. ^[2]

Pathogenesis of acute appendicitis is poorly understood. Acute appendicitis is thought to be initiated by progressive increase in intraluminal pressure that compromise venous outflow. In 50% to 80% of cases, acute appendicitis is associated with overt luminal obstruction, usually caused by fecolith, or mass of worms. Ischemic injury and stasis of luminal contents, which favors bacterial

proliferation, trigger inflammatory responses including tissue edema and neutrophilic infiltration of the lumen, muscular wall, and periappendiceal soft tissues. [3]

In chronic appendicitis there is increase in the mast cell clustering seen in the vicinity of the blood vessels and also in the region of the fibrosis. The initiating stimulus for fibrosis is a luminal obstruction and the mast cells are therefore activated. [4]

Mast cells serve a critical role in the development of inflammation and in the transition from acute to chronic inflammation. Mast cells arise from a multipotent CD 34+ precursor in the bone marrow and circulate in the peripheral blood as agranular, monocytic appearing cells. After migrating into tissues, these immature mast cells assume their typical granular morphology. These cells are widely distributed in the connective tissues especially beneath the skin, in the respiratory tract, gastrointestinal tract and adjacent to the blood vessels and peripheral nerves. [5] They are small cells, round to ovoid in shape with a diameter of 12 – 15 microns and are packed with numerous cytoplasmic granules of 0.2-0.5 microns in size.

For the demonstration of mast cells, metachromatic staining with basic aniline dye, especially toluidine blue has been widely employed. They are also visualized with a number of Alcian blue methods, Azure A, Bismarck Brown and Thionin. [6]

The type-1 hypersensitive reaction with a release of the mediators by the mast cells may be a triggering factor for the sequence of events which lead to appendicitis.

MATERIALS AND METHODS

Present study was conducted on one hundred fifty patients presenting with appendicitis in the surgical Department and Histopathology section of Pathology Department in our Institute in the year 2014- 2016.

A clinical history of the patient in terms of duration, progress, associated symptoms and any treatment received for the lesion was obtained. All patients were subjected to general medical examination. Biopsies of the appendicitis taken in the surgical department were sent in 10% formalin fixative solution to the histopathology section. Minimum of 24 hours were allowed for proper tissue fixation.

Special staining for mast cells was carried out by using 0.1% Toluidine blue stain. [7]

Mast cells were counted in 10 random high power fields (40X) having larger number of mast cells, and average per high field was determined. [8]

According John D Bancroft, Marilyn Gamble (2008) [9] the total 150 cases were divided into four groups, based on the histopathological criteria.

Group – A: Acute appendicitis presenting with a neutrophilic infiltration.

Group – B: Appendicitis with an eosinophilic infiltration.

Group – C: The appendix removed incidentally during other abdominal surgeries and showing a normal picture.

Group – D: Chronic appendicitis presenting with a lymphomononuclear infiltrate and fibrosis.

Grading:

Grade – 0: No cells

Grade – 1 +: Few cells seen in few high power fields.

Grade – 2 +: Clusters of more than 10 cells seen in some fields.

Grade – 3 +: Such clusters seen in most fields.

RESULTS

The present study was undertaken during a period of two years. The study was performed on 150 patients with appendicitis. Out of 150 cases studied 47 were females and 103 were males. The age of the patient ranged from 6-58 years. The incidence of Appendicitis was more in males (68.67%) with the male: female ratio was 2.19:1.

Maximum numbers of cases were seen between the age group of third and fourth decades of life. The commonest lesion which was noticed was chronic appendicitis in 84(56.0%) cases. The next common lesion which was noticed was acute appendicitis in 55 cases (36.67%) and acute eosinophilic appendices were noticed in 11 cases (7.33%). (table-1)

In our study 33 cases showed the grade- I count and 22 cases showed the grade- II count. There was a marked decrease in the mast cell count in the group- A lesions due to a progressive degranulation, thus making it difficult to detect the mast cells. In the group-B lesions (11 cases), the mast cell count was of grades II and III and in the group-D lesions (84 cases), the maximum number of mast cells were observed to be in grade III. The mucosal mast cell count was marginally more than that which was found in the sub mucosa. (table- 2, 3)



Figure-2 chronic appendicitis

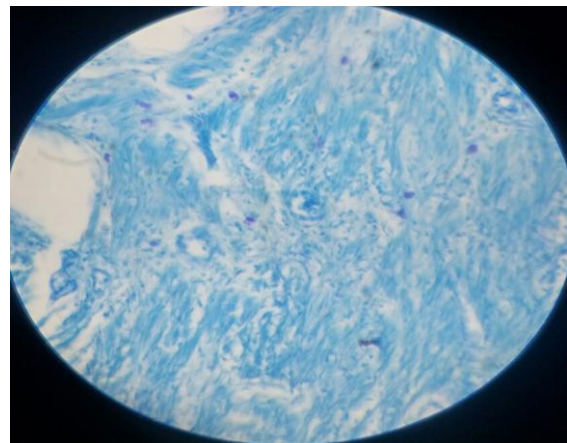


figure-3 mast cell in acute appendicitis, toluidine blue 400x



Figure-1 acute appendicitis

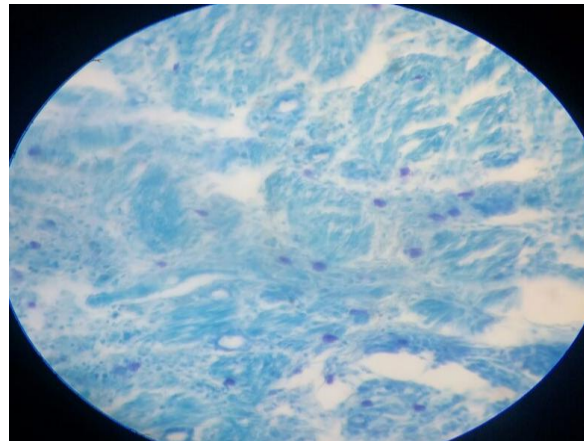


figure-4 mast cell in chronic appendicitis, toluidine blue 400x

Table-1 Mast Cells / 10hpf In The Mucosal And Submucosal layer In The Group-A, B, and D

Diagnosis	No. of Cases	Mass cell count in mucosa		Mass cell count in submucosa	
		Range	Mean	Range	Mean
Acute appendicitis	55	4-22	13	3-18	11
Acute eosinophilic appendicitis	10	4-40	22	4-32	18
Chronic appendicitis	83	5-45	25	4-44	24

Table -2 Mast cell count in mucosa

	Group A	Group B	Group D
Dr. Sulochana	11	20	22
Present Study	13	22	25

Table -3 Mast cell count in submucosa

	Group A	Group B	Group D
Dr. Sulochana	11	16	21
Present Study	11	18	24

DISCUSSION

In the present study there was little variation in the average mucosal and the sub mucosal mast cells along the length of the appendix. There were not many variations

in the mast cells with respect to the age and sex of the patients.

Acute appendicitis: groups-A and B:

In this study, out of the 66 cases, 58 cases (85.29%) showed luminal obstruction with a faecolith. The obstruction which is caused by faecoliths causes the infection in the pathogenesis of acute appendicitis. [10] In our study, mucosal ulceration was noted in 60 cases (90%). The mast cell counts were found to be reduced in the mucosal ulceration and in areas of eosinophilic infiltration. [11]

Acute appendicitis is common in the age group of 10-30 years and it is average in the age around 20 years, when the lymphoid tissue is the most prominent but in the present study acute appendicitis were seen in 3rd and 4th decade of life.

Chronic Appendicitis: Group D:

Out of a total of 84 cases, 58(69%) cases showed sub mucosal fibrosis, often focal and also extending to the lamina propria, thus suggesting that the release of the growth factors lead to a fibroblastic proliferation.

An increase in the mast cell clustering was seen in the vicinity of the blood vessels. In the lamina propria, approximately a threefold increase was seen. The increase in the density declines until the mucosa is obliterated by fibrous tissue and the foci of sub mucosal fibrosis did not show any significant increase in the mast cell density. [12] The initiating stimulus for fibrosis is a luminal obstruction and the mast cells are therefore activated. [13]

This correlated with a study done by Sulochana, 2012 [14] Who concluded that the mast cell count was more in chronic appendicitis when compared to acute appendicitis. This study correlated with the present study.

Immunologic and non immunologic stimuli cause degranulation of the mast cells. So there is a highest frequency of the mast cell and the nerve apposition in the appendix. The nerve growth factor causes hyperplasia of both the mucosal and the sub mucosal mast cells. Even the fibroblasts

have an ability to make the nerve growth factor; hence, there is an abundant potential for growth interactions between the mast cells, nerves and the fibroblasts.

CONCLUSION

We concluded that the mast cell count was higher in acute appendicitis, thus indicating an immunological or a non immunological injury and the highest in chronic appendicitis, which indicating the growth interaction between the mast cells, nerves and the fibrosis. It showed that there was definitive increase in mast cells count as the disease progresses thus substantiating their contributing role in pathogenesis.

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