Journal Homepage: - www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
Article DOI: 10.21474/IJAR01/2245
DOI URL: http://dx.doi.org/10.21474/IJAR01/2245
ISSN NO. 2320-5407

RESEARCH ARTICLE

A STUDY OF MAST CELLS IN SURGICALLY RESECTED APPENDIX.

[*]Verma A[1], Shinde R.M[2], Ghatge R.M[1], Gupta S[1], Inamdar A.A[1] and Sujata N[1].

1. Post Graduate student, Department of Pathology, D.Y. Patil Medical College, Kolhapur.
2. Associate Professor, Department of Pathology, D.Y. Patil Medical College, Kolhapur.

Manuscript Info

Manuscript History

Received: 29 September 2016
Final Accepted: 30 October 2016
Published: November 2016

Key words:-
Mast cells, Appendix, Hypersensitivity

Abstract

Appendicitis is one of the common conditions requiring emergency surgery. The exact etiopathogenesis is poorly understood in those appendices which are resected for suspected appendicitis and are classified as normal by histopathology on conventional staining. Acute appendicitis is thought to be initiated by progressive increases in intraluminal pressure that compromise venous outflow. However, faecolith are not found in many cases in which acute appendicitis is confirmed. The present study is a study of mast cells in surgically resected appendix, which includes 150 cases of acute appendicitis, chronic appendicitis, histology negative acute appendicitis , and appendices removed in the course of surgeries done for some other disease/control, who attended D. Y. Patil Hospital and Research centre, Kolhapur. This is a prospective study undertaken from May 2014 to April 2016. The results of this study show that acute appendicitis was the commonest affliction (44.65%) with chronic appendicitis being the second (28%) and histology negative acute appendicitis also sharing the large number of cases at 24%. Mean mast cell count was highest in chronic appendicitis followed by acute appendicitis and by histology negative acute appendicitis and least in appendices removed in the course of surgeries done for some other disease. Therefore, the type I hypersensitivity reaction with release of mediators by mast cells might be a predisposing factor for the sequence of events leading to appendicitis.

Introduction:-

In about 20–25% of appendicectomies performed for clinically suspected acute appendicitis, definite morphological changes are lacking on histopathological examination.[1]

Since appendectomy relieves pain, an unknown pathology is likely to exist.[2] The role of inflammatory reactions involving local endocrine cells and neuroproliferation in causing repeated attacks of pain has been described and several staining techniques including immunohistochemistry have been tried in detecting the pro-inflammatory mediators.[3] Histopathological examination still remains the gold standard method for the confirmation of the appendicitis.[4] Acute appendicitis is thought to be initiated by progressive increases in intraluminal pressure that compromise venous outflow.[5] Currently, luminal obstruction due to faecoliths or less commonly submucosal lymphoid hyperplasia especially in children appears to initiate acute inflammation in appendix.[6] However, faecolith

Corresponding Author:- Verma A.
Address:- Post Graduate student, Department of Pathology, D.Y. Patil Medical College, Kolhapur.

are not found in many cases in which acute appendicitis is confirmed. It has also been suggested that obstruction is not an important causative factor in acute appendicitis, but may develop as a result of inflammatory process. Mast cells are constantly present in appendix, the organ most commonly subjected to surgical intervention and removal. Therefore, the type I hypersensitivity reaction with release of mediators by mast cells might be a predisposing factor for the sequence of events leading to appendicitis.[7]

Methodology:-

The present study is a study of mast cells in surgically resected appendix, which includes 150 cases of acute appendicitis, chronic appendicitis, histology negative acute appendicitis (HNAA), and appendices removed in the course of surgeries done for some other disease/control, who attended D. Y. Patil Hospital and Research centre, Kolhapur. This is a prospective study undertaken in department of Pathology, D. Y. Patil Medical College, Hospital and Research centre, Kolhapur, from May 2014 to April 2016. Haematoxylin and Eosin stained sections examined microscopically and histologic interpretation was done. Toluidine blue stained sections were examined and the mast cell counts were done in 20 non-overlapping high power fields (HPF). The cell counts were done on 20 HPF, the mean cell counts / mm2 was calculated to be number of cells in 20 HPF /3.

On the basis of observations an attempt was made to study distribution pattern of mast cells in relation to various appendicular lesions.

Results:-

In the present study out of 150 cases, the clinical diagnosis of acute appendicitis was seen in 70.66 % of the total cases, while on histopathological diagnosis only 44.65% of the cases were those of acute appendicitis including classic acute appendicitis, acute suppurative, perforative and eosinophilic appendicitis. They were followed by 28% of the cases of chronic appendicitis, 24% of Histology negative acute appendicitis (HNAA), and 3.33% of the cases were of appendices removed in the course of surgeries done for some other disease/Control. Patent lumen was seen in 76.66% of the cases, while obstruction due to fecolith was demonstrated in only 14% of the cases.

Table no.1:- Age and sex distribution of various appendicular lesions.

AGE GROUP(yrs)	MALES	FEMALES	TOTAL	PERCENTAGE(%)
0-10	4	3	7	4.66
11-20	25	23	48	32
21-30	38	24	62	41.33
31-40	6	9	15	10
41-50	6	3	9	6
51-60	6	-	6	4
>60	-	3	3	2
	85	65	150	100

Table no 2:- Mean mast cell count in various appendicular lesions.

LIST OF HISTOPATHOLOGICAL DIAGNOSIS	NO. OF CASES(n=150)	Mast cell count/mm^2		Mast cell count/mm^2		Mast cell count/mm^2	
		Mucosal mast cell count		Submucosal mast cell count		Mast cell Count in muscularis propria	
		Range	Mean±SD	Range	Mean±SD	Range	Mean±SD
Classic acute appendicitis	46	7-19	10 ±3	8-26	12.5 ±3.72	7-28	14.12±3.8
Acute suppurative appendicitis	14	8-20	11.785 ±3.66	9-26	14 ±4.41	11-28	16.21±4.3
Acute perforative	04	11-17	14.75±3.03	14-26	18.5±4.7	12-23	16.75±4.0

appendicitis							
Acute eosinophilic appendicitis	03	13-17	14.66±1.7	16-21	18±2.1	14-22	18.66±3.4
Chronic appendicitis	42	11-26	18.21±3.80	11-24	16.78±3.40	11-23	17.17±3.8
Histology negative acute appendicitis (HNAA)	36	6-22	10.39±3.9	6-17	8.6 ±2	5-15	9.8 ±2.7
Appendices removed in the course of surgeries done for some other disease/Control	05	3-8	5.2±1.7	3-7	5 ±1.4	2-6	5 ±1.46

Table no.3:- Mean mast cell count in various age groups

Age(in years)	**Histopathological diagnosis**	**Mean mast cell count**
<15 Years	Classic acute appendicitis	13±4
	Acute suppurative appendicitis	10±1.04
	Acute eosinophilic appendicitis	17±0
	Acute perforative appendicitis	-
	Chronic appendicitis	23±6
	HNAA group	8.±1.4
	Control group	-
15 to 45	Classic acute appendicitis	12.33±2.88
	Acute suppurative appendicitis	14.3±4.6
	Acute eosinophilic appendicitis	17±3
	Acute perforative appendicitis	22±4
	Chronic appendicitis	17.24±3.5
	HNAA group	8.8±1.4
	Control group	4.7±1.2
>45	Classic acute appendicitis	8.5±0.5
	Acute suppurative appendicitis	15.6±0
	Acute eosinophilic appendicitis	-
	Acute perforative appendicitis	21±3
	Chronic appendicitis	14.75±1.63
	HNAA group	10.6±3.2
	Control group	5.6±0

Table no.4:- Mean mast cell count according to sex.

Sex	**Histopathological diagnosis**	**Mean mast cell count in mucosa**	**Mean mast cell count in submucosa**
Male	Classic acute appendicitis	9.51±2.42	11.5±2.61
	Acute suppurative appendicitis	9.75±1.66	11.62±2.54
	Acute eosinophilic appendicitis	14.6±1.7	14.66±1.7
	Acute perforative appendicitis	15±2	20.5±5.5
	Chronic appendicitis	17.7±4.08	16.41±4.1
	HNAA group	9.52±2.52	9.19±2.1
	Control group	5.25±1.9	4.7±1.48
Female	Classic acute appendicitis	11±3.2	13.5±4
	Acute suppurative appendicitis	14.5±3.9	17±4
	Acute eosinophilic appendicitis	17±0	15±0
	Acute perforative appendicitis	13.5±2.5	16.5±2.5
	Chronic appendicitis	19.31±3.2	17.72±3.2
	HNAA group	8.8±1.85	8.9±2.7
	Control group	5±0	7±0

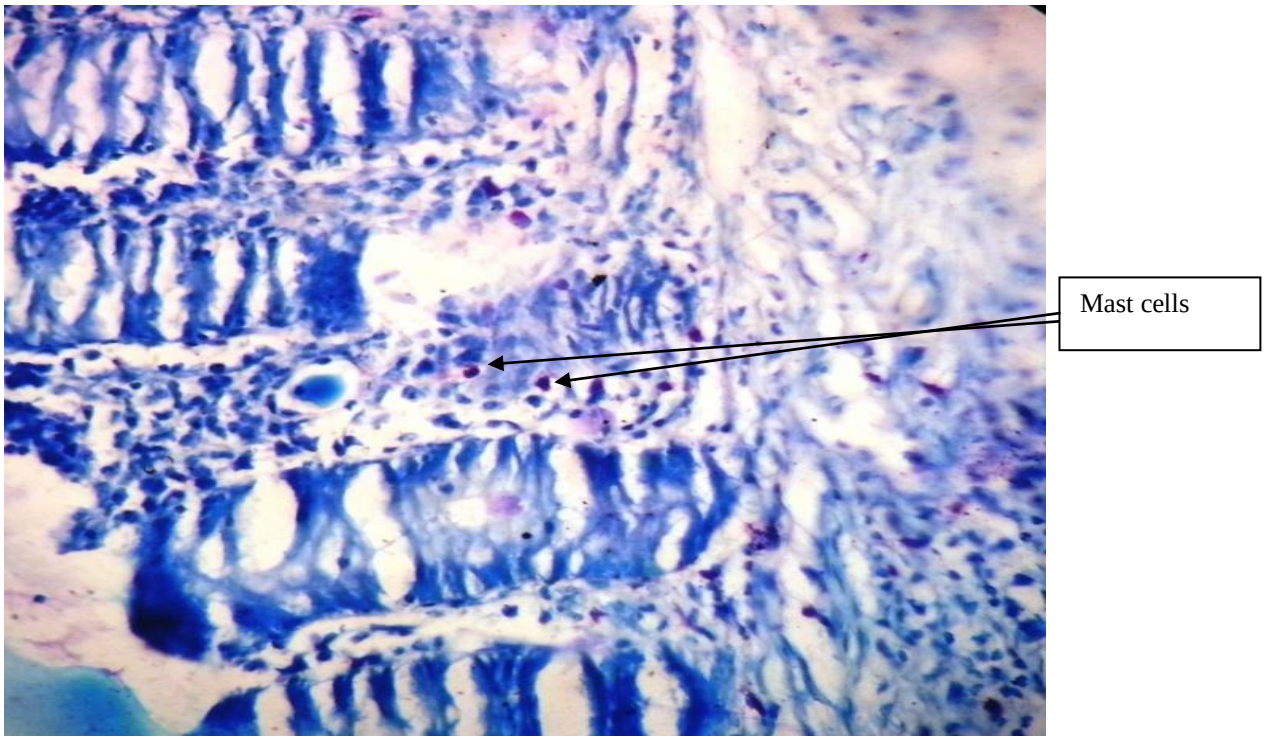

Figure no.1:- Photomicrograph showing mast cells in the mucosa of appendix (40X, Toluidine blue)

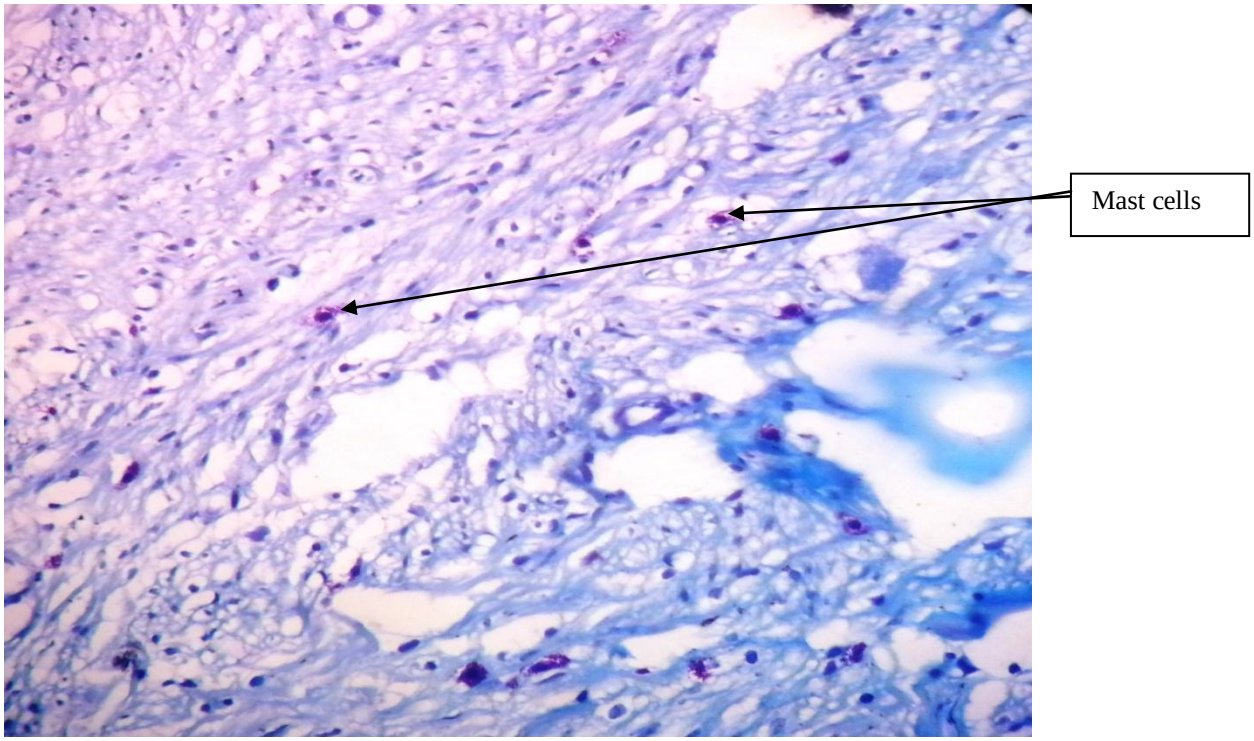

Figure no.2:- Photomicrograph showing mast cells in submucosa of appendix (Toluidine blue stain 40 X)

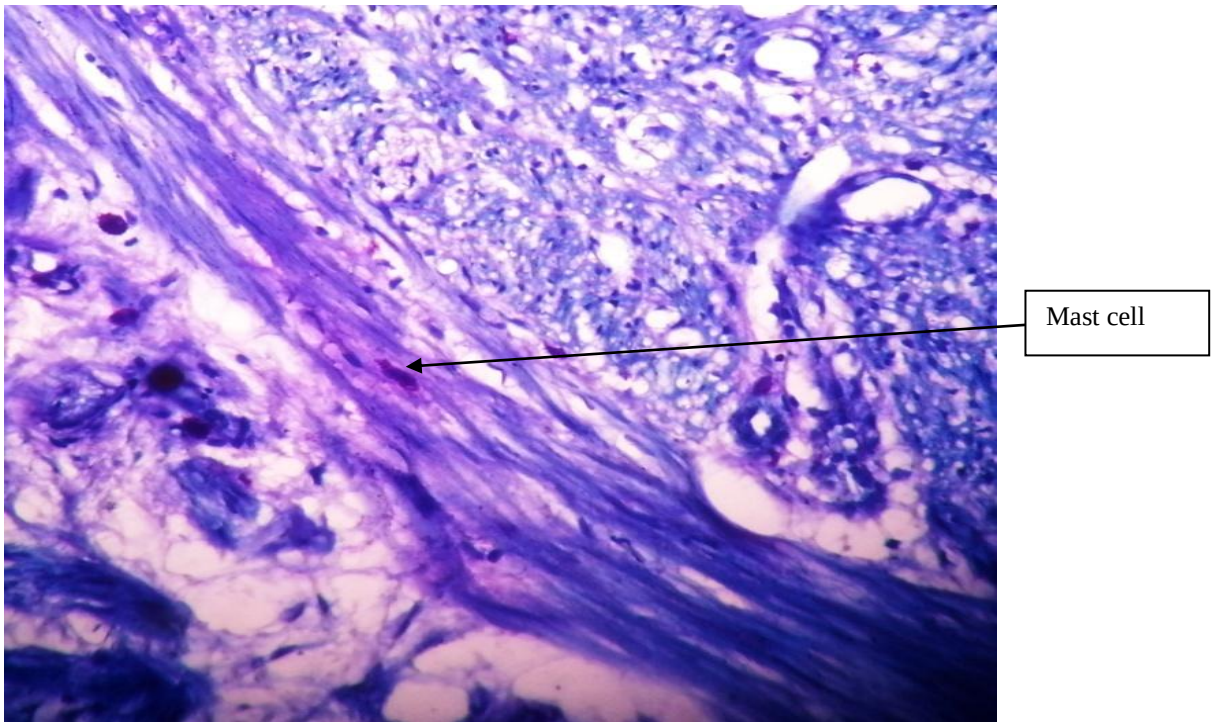

Figure no.3 Photomicrograph showing mast cell in muscularis propria of appendix (Toluidine blue stain 40 X)

Discussion:-

The results of this study show that acute appendicitis was the commonest affliction (44.65%) with chronic appendicitis being the second (28%) and histology negative acute appendicitis (HNAA) sharing the large number of cases at 24%. It can be concluded that most of the studies including those done by Samsi A.B et al[8], Jess P et al[9], Butler C[10], Crabbe MM et.al[11], Blair NP[12], Andiran F et al[13], Duzgun AP et al[14], Mysorekar VV[7] et al, and Sharma S et al[15] report a slight male predominance, which is found in the present study (1.30:1) as well.

Mean mast cell count was highest in chronic appendicitis followed by acute appendicitis, and histology negative acute appendicitis (HNAA) and least in appendices removed in the course of surgeries done for some other disease which correlated with the studies done by Shah AA et al[16], Kolur A et al[6], Singh U.R et al[17], Coskun N et al[18], Nagaraj G et al[19], Kumaran C et al[20], Yang Z et al[21]. Increase in mean mast cell count was also highest in chronic appendicitis followed by acute appendicitis in studies done by Sonti S[22] and Naik R[23] which correlated with our study.

In acute appendicitis, mean mast cell count was higher in submucosa and muscularis propria when compared with mucosa of appendix which correlated with the studies done by Shah AA et al[16], Kolur A et al[6] and , Kumaran C et al[20].

In chronic appendicitis mean mast cell count was highest in mucosa followed by muscularis propria and submucosa which correlated with the studies done by Shah AA et al[16], Kolur A et al[6] and Sonti S[22].

In Histology negative acute appendicitis (HNAA) mean mast cell was highest in mucosa followed by muscularis propria and submucosa which correlated with the studies done by Sonti S[22], Naik R[23] and Yang Z et al[21].

In Appendices removed in the course of surgeries done for some other disease, mast cell counts were almost equal in mucosa, submucosa and muscularis propria.

The mean mast cell count was found to be increased in areas of mild fibrosis especially in mucosa, whereas in areas where degree of fibrosis was more the mean mast cell count was less in when compared with areas of early fibrosis. Mast cells, seen in all lesions of appendix were more easily identified in submucosa.

In submucosa, mast cells were larger, spindle to polygonal in shape and had coarse numerous granules as compared to mast cells in mucosa.

An increase in the mast cell clustering was seen in the vicinity of the blood vessels and nerve fibres.
No correlation was found between mast cells, age and sex of the patient.
When compared with mean mast cell count in all the appendicular lesions in our study there is corresponding increase in mean eosinophilic count which correlates with the studies done by Kolur A et al[6] and Shrestha R et al[24].
Mast cell count was found to be higher in the areas of mild fibrosis indicating the growth interaction between the mast cells and fibroblasts in areas of fibrosis.

Conclusion:-

Toluidine staining technique is easy, simple, long lasting and gives good result for identification of mast cells in appendix.

Mast cell counts were lowest in appendices removed in the course of surgeries done for some other disease/Control, while they were significantly higher in histology negative acute appendicitis (HNAA) group, acute appendicitis and highest in chronic appendicitis. Also obstruction due to faecolith could not be demonstrated in many cases of appendicitis.

Increased eosinophil count with an increase in mast cell count observed in the present study in appendicitis may be due to the consequence of mediators released by mast cells such as eotaxin.
Therefore, the type I hypersensitivity reaction with release of mediators by mast cells might be a predisposing factor for the sequence of events leading to appendicitis.

References:-

1. Amber S, Mathai AM, Naik R, Pai MR, Kumar S, Prasad K. Neuronal hypertrophy and mast cells in histologically negative, clinically diagnosed acute appendicitis: a quantitative immunophenotypical analysis. Indian J Gastroenterol 2010;29(2):69–73.
2. Nemeth L, Rolle U, Reen DJ, Puri P. Nitrergic hyperinnervation in appendicitis and in appendices histologically classified as normal. Arch Pathol Lab Med 2003;127(5):573–8.
3. Di Sebastiano P, Fink T, Mola FF, Weihe E, Innocenti P, Friess H, et al. Neuroimmune appendicitis. Lancet 1999;354(9177):461–6.
4. Shrestha R, Ranabhat SR, Tiwari M. Histopathological analysis of appendectomy specimens. Journal of Pathology of Nepal 2012; 2 : 215-19
5. Jerrold R, Turner. The Gastrointestinal Tract. In : Schmitt W, Kumar, et al. Robbins & Cotran Pathologic Basis of Disease, 8th ed ; 2010. p. 1344.
6. Kolur A, Patil AM, Agarwal V, Yendigiri S, Sajjanar BB. The Significance of Mast Cells and Eosinophils Counts in Surgically Resected Appendix, J Interdiscipl Histopathol 2014;2(3):150-3.
7. Mysorekar VV, Chanda S, Dandeka CP. Mast cells in surgically resected appendices. Indian J Pathol Microbiol 2006;49(2):229-33.
8. Samsi A.B, Adarkar N.V, Kamat R.S: A study of 100 consecutive cases of acute appendicitis with their histopathological findings: Ind J Surg: 1969: 574-79.
9. Jess P, Bjerregaard B, Brynitz S, Holst-Christensen J, Kalaja E, Lund-Kristensen J. Acute appendicitis. Prospective trial concerning diagnostic accuracy and complications. Am J Surg 1981;141:232-4.
10. Butler C. Surgical Pathology of acute appendicitis. Hum Pathol 1981;12(10):870-8.
11. Crabbe MM, Norwood SH, Robertson HD, Silva JS. Recurrent and chronic appendicitis. Surg Gynecol Obstet 1986;163(1):11-3.
12. Blair NP, Bugis SP, Turner LJ, Macleod MM. Review of the pathologic diagnoses of 2216 appendectomy specimens. Am J Surg 1993;165:618-20.
13. Andrian F, Dayi S, Caydere M, Ustun H. Chronic recurrent appendicitis in children: An insidious and neglected cause of surgical abdomen. Turk J Med Sci 2002;32:351-4.
14. Duzgun AP, Moran M, Uzun S, Ozmen MM, Ozer VM, Seckin S, et al. Unusual findings in appendicetomy specimens: Evaluation of 2458 cases and review of literature. Ind J Surg 2004;66(4):221-6.
15. Sharma S, Mahajan D, Rasool M, Bashir S, Hafiz A, Wajahat M. Histopathological of appendicectomy speciemen: A 5 year study. Sch. J. App. Med. Sci. 2014; 2(1B):176-80.

16. Shah AA, Patel M, R J, Joshi D. Mast cells in Surgically Resected Appendices. International Journal Of Scientific Research 2013;2(7):372-76
17. Singh U, Malhotra A, Bhatia A. Eosinophils, mast cells, nerves and ganglion cells in appendicitis. Indian J Surg 2008;70:231-4.
18. Coskun N, Sindel M, Elpek GO. Mast cell density, neuronal hypertrophy and nerve growth factor expression in patients with acute appendicitis. Folia Morphol 2002;61(4):237-43.
19. Nagaraj G, Das S, Venkatesha M, Lingiah HK. A comparative study of mast cells in appendix. Int J Med Sci *Public Health 2015;4(11):1611-4.*
20. Kumaran C, Divya Lakshmi L. Mast Cells in Appendicitis: A Study. J evid based med healthc 2015;2(3):5165-70.
21. Yang Z, Esebua M, Layfield L. The role of mast cells in histologically "normal" appendices following emergency appendectomy in pediatric patients. Ann Diagn Pathol 2016;24:1-3.
22. Sonti S. A study on the mast cells in appendicitis. J Clin Diagn Res 2012;6(7):1276-9.
23. Naik R. Gowda RJ, Pai MR. The mast cell counts in surgically resected appendices. J Indian Med. Assoc. 1997 ;95(11) 571-72
24. Shrestha R, Shrestha A, Tiwari M, Ranabhat S, Maharjan S. Role of Eosinophils in Acute Appendicitis. J Nepal Med Assoc 2015;53(197):12-7.