Original Article

Pathology

Disease Trends in Appendix in Relation to Age, Gender and Month of the Year

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ABSTRACT

Background: Appendicectomy specimens received with suspected acute appendicitis often macroscopically appear normal in size, shape etc but a more menacing underlying pathology can be found in histopathological analysis of these cases. Worldwide appendicitis is a commonly found condition in children and adults but cancers of the appendix are very rare. Most of them are found accidentally on appendectomies performed for appendicitis.

Study Design: Cross sectional study.

Place and Duration of Study: This study was conducted at Dow diagnostic research and referral laboratory, DDRRL, OJHA campus Karachi from January 2011 till December 2011.

Materials and Methods: We evaluated Histopathology reports of all appendicectomy specimens received at the Dow Lab, Ojha campus, Karachi for the past one year. Data analyses focused on confirmation of acute appendicitis, incidental unexpected findings and whether these unexpected findings can affect the management of patient. Also to assess the pattern of variation with age, sex, and seasons of the year. We also have tabulated each appendectomy by month and season of its occurrence. Analyses are done on SPSS version 16. Descriptives and cross tabs are used.

Results: The histopathology reports disclose a variety of hyperplasic and malignant incidental lesions besides different acute inflammatory conditions. Among the total 414 cases, 77 cases (18.5%) are hyperplasic conditions, 329 cases (79.4%) are acute inflammatory condition 5 cases (1.2%) are parasitic infestation and 3 cases (0.72%) are cancers. Males are affected more commonly then females with a ratio of 2.1:1. Most commonly children are involved with the hyperplasic appendix lesions while adults with peak incidence in the 13-40 years of age are involved in acute inflammatory conditions. Carcinomas occur in the later ages. Incidence is higher in the months of February, March, April, May and September.

Conclusion: Findings in the appendix lesions consist of hyperplasic, inflammatory conditions, parasitic infestation and tumors. Lesions are most common in the summer and spring seasons. Three cases (0.72%) of appendiceal tumors are found which affect the outcome of patient management. Results of our study show that in addition to the operative findings, the routine histopathological examination of the appendix yields important clinical information also so it should be undertaken in all cases.

Key Words: Appendicitis, histopathology, seasonal variation

INTRODUCTION

Acute appendicitis is one of the most common general surgical emergencies. [1] And the most common cause of abdominal pain worldwide. [2] Appendicitis seems to be more common in societies with higher technological standards and rare in traditional settings. [6] Wide variations have been reported in relation to age, gender and seasons but reasons for these variations are not clear. [2, 3, 9] Appendicitis is caused by obstruction of lumen of appendix which leads to the progressive pathologic changes. [3] Fecoliths, parasites, tumors, foreign bodies and viral and bacterial agents all can obstruct the lumen. [3] Pathologically, a necessary microscopic feature is neutrophils infiltration of the muscularis propria and in complicated forms; it is often accompanied by bacterial invasion. [22] Importance in the structure of the appendix is the magnitude of lymphoid tissue in its walls. It is sometimes referred to as the abdominal tonsil. In serial sections of a normal appendix numerous lymphoid follicles may be seen lying in the mucosa or even in the submucous layer. These resemble the solitary glands as in other parts of the intestinal tract, but, much more abundant in comparison with the size of the appendix. [27] It is said that an appendix three and one-half inches long contains from I50 to 200, or more, such follicles. This lymphoid tissue reaches its height of development in late childhood or adolescence, and, from then on, its tendency is to undergo involutional changes resulting in sclerosis and atrophy. [27]

Regarding the difference in incidence of appendicitis worldwide two theories attempt to explain the difference. [6] These are high dietary fibre intake as a protective factor against inflammation which is Burkitt's hypothesis and the more recent theory which relates the increasing incidence of appendicitis to improved hygienic standards that reduce the exposure

of the gut to bacterial antigens by Barker and Morris and Walker and Walker. [6] This is assumed to change the pattern of immunity and in consequence leads to lymphoid hyperplasia in the appendiceal wall and obstruction of the lumen. [6]Recent evidence suggests that the appendix may have a role in the immunological functions of the body, especially in the maturation of B lymphocytes. [12]

In children lymphoid hyperplasia of the appendix produces symptoms simulating appendicitis, it is relieved by appendicectomy. [27]

Carcinoma of the appendix is very rare and is typically found incidentally in approximately 1% of appendectomy specimens. [24] First symptom of appendix cancer mostly is appendicitis.[24] According to a report published by the National Cancer Institute using the Surveillance, Epidemiology, and End Results (SEER) database, appendiceal neoplasms account for approximately 0.4% of gastrointestinal tumors. The majority of appendiceal tumors are carcinoids, about 66% with mucinous cystadenocarcinoma about 20% and adenocarcinoma 10%. Then the rarer forms are adenocarcinoid, signet ring, non Hodgkin's lymphoma etc. [24]

In 1914, Dr Gosset and Dr Mason postulated that carcinoid tumors are made up of enterochromaffin cells, a type of neuroendocrine cells within the lamina propria and Sub mucosa. These cells produce and contain approximately 90% of the serotonin in our bodies. [24]The diagnostic criterion for adenocarcinoma is the presence of invasive neoplastic cells beyond the muscularis mucosa. [29] of all the subtypes, signet ring had the lowest overall 5-year survival rate at 18%. [24].

The practice of sending appendicectomy specimens for histopathological analysis varies. [1] there are as yet no guidelines as to whether all appendices should be sent as a matter of routine.

We will report on the incidence of unexpected pathology in resected appendix specimens at Dow lab along with different trends in relation to age, gender and seasons of occurrence.

MATERIALS AND METHODS

We have reviewed all the histopathology reports of appendicectomy specimens received at Dow lab, OJHA campus Karachi, from January 2011 till December 2011.

Appendicectomy specimens are prepared according to a hospital-defined protocol, involving transport to the pathology laboratory after receiving and labeling it with patient's data. Specimens are sectioned at the tip, body and base. Paraffin wax sections are stained with haematoxylin and eosin and examined by a consultant or senior pathologist along with a junior trainee. Details of macroscopic and microscopic findings are issued in the final report.

Final histopathological diagnosis is divided into four (4) groups, hyperplasic lesions, Non specific inflammatory lesions, parasitic infestation and tumors and tumor like conditions. [12]

Age is categorized into 5 groups with 0-4 as small children, 5-12 as children, 13-40 as adolescent and young adults, 41-65 as adults and above 65 as elderly age group. [30]

RESULTS

A total of 414 histopathological reports of appendix lesions from January 2011 till December 2011 are reviewed and analyzed based on macroscopic and microscopic findings.

There are 264 males (63.8%) and 150 females (36.2%) in our study sample with a age range of 5 years to 65 years and an overall mean age of peak incidence in the 13-40 (85.3%) years of age. (Figure 1) followed by 5-12 years of age (9.2%) and then followed by 41-65 years (5.07%) and the least common is age above 65 years (0.46%). We did not find any case in age range of 0-4 years. From our study sample of 414 cases, about 77 (18.5%) have minor or hyperplasic changes, including reactive lymphoid hyperplasia and fibroid appendix.

Then followed by appendicitis and related conditions consisting of about 329 cases (79.4%) including acute appendicitis (35.7%), acute appendicitis with serositis (19.8%) , acute suppurative appendicitis with serositis (11.8%) , acute appendicitis with pariappendicitis (4.3%), and acute appendicitis with peritonitis (7.7%).

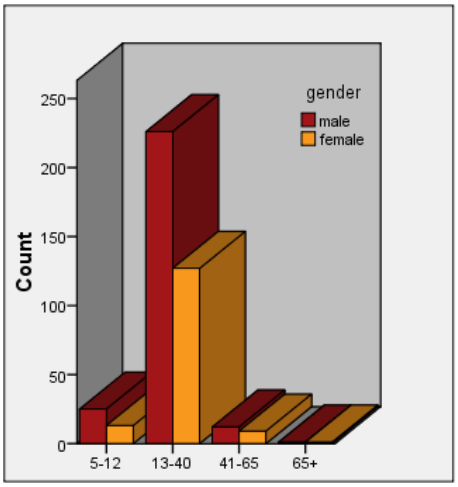

Figure No.1. Bar chart showing sex and age distribution of appendix lesions

We also found 5 cases (1.2%) of enterobius vermicularis infestation. Three cases in the age range of 5-12 and 2 cases from 13-40 years with nearly equal distribution in both genders.

Also 3 cases (0.72%) of tumor and tumor like conditions are also found in our study group, including

carcinoid, signet ring carcinoma and adenocarcinoma, one case each. Carcinoid occurs in male at age of 45 years while signet rings occur at 85 years and adenocarcinoma at 25 years, both occurs in females. (Table 1. Figure 2)

Table No.1: Findings from appendicectomy specimens

Diagnosis	Total no of cases.	Males	Females.
1.Minor/hyperplasic changes.	77 cases (18.5%)		
Reactive lymphoid hyperplasia	68(16.4%)	33(48.5%)	35(51%)
Fibroid appendix.	9(2.2%)	5(55.6%)	4(4.5%)
2.Appendicitis and related conditions	329cases (79.4%)		
Acute appendicitis.	148(35.7%)	87(58.7%)	61(41.2%)
Acute appendicitis with serositis	82(19.8%)	64(78%)	18(21.9%)
Acute suppurative appendicitis with serositis	49(11.8%)	33(67.3%)	16(32%)
Acute appendicitis with pariappendicitis	18(4.3%)	12(66.7%)	6(33.4%)
Acute appendicitis with peritonitis	32(7.7%)	27(84.3%)	5(15.6%)
3.Parasitic infestation	5 cases (1.2%)		
Enterobius vermicularis.	2(40%)	3(60%)	5(1.2%)
4.Tumor and tumor like conditions	3 cases (0.72%)		
carcinoid	1(33.4%)	1(33.4%)	0
Signet ring carcinoma	1(33.4%)	0	1(33.4%)
Adenocarcinoma.	1(33.4%)	0	1(33.4%)

Table No.2: Monthly incidence of appendix lesions.

Months.	Diagnosis					
	Minor/ hyperplasic lesions.	appendicitis and related conditions.	parasitic infestation	tumor and tumor like	Total.	percentages
January	5	27	0	0	32	7.78%
February	10	40	2	1	53	12.89%
March	4	44	2	0	50	12.1%
April	16	48	0	1	65	15.81%
May	6	42	1	1	50	12.1%
June	10	16	0	0	26	6.32%
July	10	20	0	0	30	7.29%
August	1	11	0	0	12	2.91%
September	7	32	0	0	39	9.4%
October	3	20	0	0	23	5.56%
November	1	17	0	0	18	4.37%
December	3	10	0	0	13	3.16%
Total.	76	327	5	3	411	

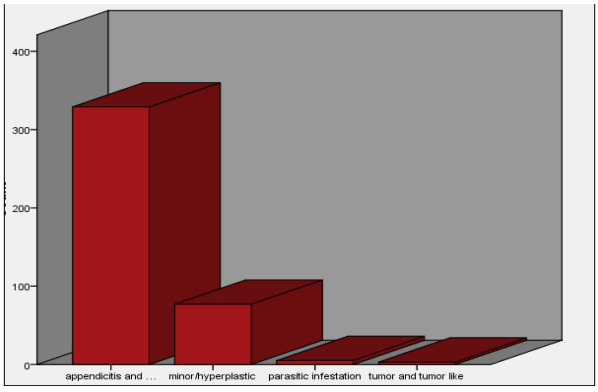

Figure No.2: Bar chart showing different appendix lesions

Among the age group categories we found no case in the first category of small children, 0-4 years of age, then next category is of children from 5-12 years of age in which we found 38 cases (9.2%),consisting of 25 in males and 13 in females. Then major proportion of our result come from the category of adolescent and young adults from 13-40 years of age in which we found 353 cases (85.3%), Consisting of 226 males and 127 females. Next is the adult category from 41-65 years of age we found 21 cases (5.01%) consisting of 12 males and 9 females, and last elderly category is 65 and above, in them we found only two cases (0.48%) one in male and one in female.

We also found appendix lesions with different frequencies in different months of the year, and most frequently they are found in the month of February, March, April and May and September. (Figure 3)

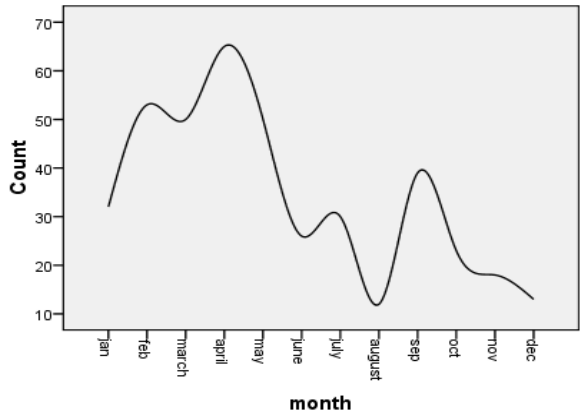

Figure No.3: Line graph showing distribution of appendix lesions by month

The one year (January 2011-december 2011) seasonal findings of appendix lesions are shown in Table 2.

DISCUSSION

The purpose of histopathological examination of all resected appendix specimen is twofold. First, it allows the confirmation of acute appendicitis and other related inflammatory conditions especially when intra-operatively they are not apparent. Second, it may disclose additional incidental pathologies that may affect subsequent clinical management of the patient. [1]
Few studies have analyzed benefits of sending all appendicectomy specimens for histopathology [1, 11] as it may reveal some incidental findings which may affect the management of patient. As illustrated in our study sample of 414 cases in which histopathological evaluation have revealed three (0.72%) tumors including carcinoid, signet ring carcinoma and adenocarcinoma, each contribute 0.24% of all appendix specimens in the study. One Previous study has reported 0.088% of carcinoid tumors. [11] Another study reported 0.1% of cases of carcinoid tumors. [12] Another study by Moertel et all found carcinoids to be 0.3-0.7% in incidence. [11] Previous study by Deans et al, and Alun et al, Polat et al also recommended that in few cases operating surgeons can miss the pathology, the majority of which required further investigations. [1]
In up to 20% of appendiceal tumors a secondary malignancy may develop so it is recommended that all cancers of appendix have to be followed up. [1]
Majority of lesion in our study group occur in males 264 cases in all age groups and is about 63.8% as similarly is reported by other previous studies also. [2, 5, 9] With a male to female ratio of 1.76:1 as also reported by previous studies with a ratio of 2.21:1.2. [5] An unusual predominance of females is also found with a ratio of 1:3.7 in a previous study. [6]
Country, geographical region, race, sex, age, and seasons have affect on the wide variation in incidence of acute appendicitis. [2] The predisposing factors to appendicitis are thought to be multifactorial, ranging from dietary, age, genetic predisposition, viral and bacterial infections, and parallel changes in humidity. Vascular disorders, stressful life, smoking, and inadequate childhood breast feeding, are also being suggested by some authors. The increasing number of 'fast food' restaurants where mainly high-carbohydrate, low-fiber diets, confectionaries, and sweets are served could have contributed to the increase in the incidence[2]
Highest incidence of appendiceal lesions in our study occur in the age group of 13-40 years as is also reported by other previous studies, where higher incidence was found in 10-19 years [2] and 10-20 years [5] and 10- 30 years [9] although Mangete from Nigeria found comparatively higher incidence in females. [9] Followed by 5-12 years of age (9.16%) and then followed by 41-65 years (5.07%) and the least common is age above 65 years (.46%). We did not find any case in age range of 0-4 years, similarly previous studies also found no obvious trends in the 0-4 age group. [4]
A seasonal pattern is also found in our study with spring and summer seasons having higher incidence as is also reported in the previous studies. [2, 9] Many previous studies have shown low incidence of acute appendicitis in fall and winter with sharply rising incidence in spring and summer. [3] frequent cases are observed in February, March, April, and May and least no. of cases found in December, as also found in other studies to be highest from April till September and start declining from October till December. [2] Some previous authors have also stated the increase no. of cases of acute appendicitis related to incidence of viral infections during warmer months. [3, 9], Sanda et al, [19] have suggested Spring months, where there is intense challenge to the mucosa-associated lymphoid tissue from allergens in the dust, due to the sandstorms of the season in the Arabian Peninsula. [9] The presence of seasonal variation shows the possibility of heterogeneous extrinsic factors such as, humidity, allergens, sun radiation, and viral and bacterial infections in the etiogenesis of appendicitis.
Histological types include 77 hyperplasic cases about 18.5% including reactive lymphoid hyperplasia which is most frequent among hyperplasic cases about 15.9% and the benign follicular hyperplasia least common about 0.5% and fibroid appendix about 2.2%. As Found out in previous studies also that among the children operated upon with a diagnosis of appendicitis a little less than ten per cent showed no evidence of inflammatory change in the appendix whatsoever, but all of them did show definite and constant microscopic

changes involving the lymphoid follicles with. [27] Barss reported no microscopic inflammatory changes, but in all there was a marked hyperplasia of the lymphoid tissue. We find nearly equal distribution in both males and females of lymphoid hyperplasia while previous study found more girls than boys for the lymphoid hyperplasic lesions. [27] Most of the lymphoid hyperplasic lesion in the age range of 13-40 years while in previous it was not more the 12 years for any hyperplasic case. [27]

Among the Acute inflammatory conditions of appendix which comprises 79.4% of cases in our study group, also in previous study to be about 85.1%, from which acute appendicitis constitute 35.7%, as also found in previous study to be 41.7% [12] followed by acute appendicitis with serositis 19.8%, acute suppurative appendicitis with serositis about 11.8% ,acute appendicitis with pariappendicitis about 4.3%, and acute appendicitis with peritonitis about 7.7% of cases. Inflammatory conditions are most common at the age range of 13-40 years and second decade is also the highest occurrence in a previous study also [4] appendicitis is also becoming more widespread in the urban centre's of Asia and Africa as western style diet is being adopted by more and more people. [5]

The high prevalence of intestinal parasites in the developing world could also account for some cases of appendicitis, as it has been noticed to be initiated by or associated with them. The commonly associated parasites are schistosoma mansoni, haematobium, Enterbious vermicularis, ascaris, Entamoeba histolytica, and pin worm, among others. [2]We found in our study 5 cases (1.20%) of enterobius vermicularis.

CONCLUSION

Appendiceal diseases show different frequencies in different months of the year and most frequently they occur from February to May and slightly increased in September may be due to rainfall. Age distribution has similar pattern in both genders mostly involving second and third decade and males had the highest incidence in all types of appendix diseases. This study conclude that appendicectomy specimens from patients with clinically suspected appendicitis show diversity in their histological characteristics; and that routine histological examination can yield clinically significant information in a considerable minority of patients. So this study supports the sending of all appendicectomy specimens for routine histopathological examination.

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