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Study of anatomical variations of appendix in appendectomy patients at Wad Medani Teaching Hospital, Gezira- Sudan

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Abstract

Background The appendix, a true diverticulum arising from the posteromedial cecal border. The base of the appendix can be reliably located at the tip of the cecum. The length of the appendix varies and it can be placed in different positions. Anatomical variations in the location of appendix can prove challenging for surgeons.

Aim: To study the anatomical variations of the appendix in patients underwent appendectomy

Methods: This cross-sectional study was conducted at the surgical department in Wad Medani teaching hospital during the year 2023 involving 50 appendectomy patients, the collected information was entered into SPSS software (Version. 23) and analyzed.

Results: Twenty-nine (58%) out of 50 patients were females, while 21were males (42%). 58% of patients were between 18-30years. The retrocecal position of the appendix's head was the commonest anatomical position (68%). The mean length of the appendix was 70 mm. Mesoappendix was complete in 74% of the patients and the posterior position was the most common position (78%). Significant association was found between sex and length of appendix *p=0.02* but not between sex and the position of the appendix head *p=0.46*.

Conclusion: The study concluded that, a high frequency of retro-cecal position was observed and posterior position was the most common appendix orientation, whereas most of the patients have had a complete mesoappendix.

Keywords: Variations; Appendectomy; Retro-cecal; Mesoappendix

1. Introduction

The appendix, a true diverticulum arising from the posteromedial cecal border, is located in close proximity to the ileocecal valve. Is is connected by a short meso-appendix to the lower part of ileal mesentery (Ashindoitiang, 2012). The base of the appendix can be reliably located near the convergence of the taeniae coli (Deshmukh, 2014), but its head can be placed in different situations. The diversity of situations is categorized into six locations: retrocecal, pelvic, subcecal, preileal, retroileal, and post hepatic (Schwartz, 2016), the retrocecal position is by far the most common (Xiang, 2018). In addition, factors such as posture, respiration, and distention of adjacent bowels can influence the position of the appendix.

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Appendectomy for acute appendicitis is one of the most frequent indications for emergent abdominal surgery. An important anatomical landmark for surgeons performing appendectomy is the convergence of the taeniae coli which marks the base of the appendix. By following them inferiorly, the appendix can be located and resected. (Childers, 2019)

The appendix can have a variable length, ranging from 5 to 35 cm, an average of 9 cm. The function of the appendix has traditionally been a topic of debate (Schumpelick., 2000). Though a remarkably constant structure in man, the appendix is nevertheless occasionally subject to the extremes of variation, that is, total suppression and duplicity. Acute appendicitis is the most common cause of acute abdomen among young patients. However, it may also be seen in any age group (Sabiston., 2001). Some studies have shown that age, race, sex, geographic region, and diet can affect the position of appendix (Williams., 2018). Dejanlić et al. have evaluated 65 patients who underwent open appendectomy in Serbia. They have reported pelvic position as the most common position for vermiform appendix (57.71%) and paracecal as the least one (3.07%) (Denjalić, 2020). Acute appendicitis is mainly diagnosed by medical examination and clinical evaluation. There is no definitive diagnostic laboratory test or imaging (Denjalić., 2020).

In Sudan, Bakheit MA et al, addressed the anatomical variation of appendix. In this study they stated that acute appendicitis was found to be more common in males than in females and among adults than children. The average length was 8.9 cm in males and 9.4 cms in females. The appendix was commonly found to be retrocaecal (58.3%) on pelvic (21.7%) or paracaecal (11.7%). In conclusion, average length of the vermiform appendix was longer in females than in males (Bakheit, 1999).

Knowledge of common position(s) of the appendix helps on-time diagnosis of acute appendicitis. Variable positions of the appendix may mislead physicians to make a wrong decision or diagnosis of other diseases. Delayed diagnosis of acute appendicitis may lead to its perforation and subsequent abscess or peritonitis. So, accurate information about the anatomical location of appendix can improve prognosis of the disease. The present study was performed to determine the anatomical locations of the appendix, its length, and status of mesoappendix of appendix (complete or incomplete), as well as their relationship with sex in appendectomy patients.

2. Methods

This analytical cross section study took place at the surgery department in Wad Medani teaching hospital, which considered as main governmental, public, teaching hospital that located in Gazira state in the period between March 2023 and August 2023. A total of 50 consecutive patients presenting with acute appendicitis and underwent appendectomy were involved in the study. Ethical approval was obtained from ethical review committee of faculty of medicine, Gezira University and Hospital administration office. Informed consent was obtained from patients who agreed to participate. Exclusion criteria include patients who refuse to participate in the study and a clinical diagnosis of acute appendicitis was the only inclusion criteria.

Data was collected through direct patients interviewing, using standardized, structured questionnaire compose of both open and close ended questions, as well as observation section filled by the researcher during surgical operations including: the position of the appendix head, the position of the base of the appendix, the extent of the mesentery (to determine complete and incomplete mesoappendix) and the measurement of the appendix from the base to the tip before eventual removal.

Data were entered and analyzed using SPSS (Statistical Package for the Social Sciences) version 23.0. P-values of ≤0.05 will be considered statistically significant.

3. Results

This study shows that 29 (58%) out of 50 patients were females, while 21were males (42%) and the highest incidence of acute appendicitis (58.0%) occurs between the ages of 18- 30years in both sexes and in (28%) occurs in less than 18, in only (6%) occurs between 31-40 years old [Table 1]. Intraoperative findings reveal that a retrocecal position of the appendix was the most common anatomical position and it was found in (68%), subceal in (14%), retroileal in (12%), pelvic, post hepatic and preileal positions each was seen in one patient (2%) [Table 2]. In majority of patients (58.0%), the length of the appendix was 51-100 mm, and 30-50 mm in (32%) of patients, only 5 patients (10 %) had appendix length 101-150 mm, and the average length of appendix was 70 mm [Table 3]. Complete mesoappendix (reach the tip) was observed in (74%) of patients whereas incomplete one was observed in (26%) [Table 4]. Most participants 78% were having posterior appendix location in relation with the base of the cecum [Table 5]. Significant association was

found between sex and length of appendix (*p=0.02)* but not between sex and the position of the appendix head (*p=0.46)* [Table 5].

Table 1 Showing age distribution

Age	Frequency	Percent
<18	14	28.0
18-30	29	58.0
31-40	3	6.0
>40	4	8.0
Total	50	100.0

Table 2 Position of appendix head

Position	Frequency	Percent
Retrocecal	34	68.0
Subcecal	7	14.0
Retroileal	6	12.0
Pelvic	1	2.0
Post hepatic	1	2.0
Preileal	1	2.0
Total	50	100.0

Table 3 Distribution of participants according to Length of the appendix

Length of appendix in mm	Frequency	Percent
From 51-100	29	58.0%
From 30-50	16	32.0%
From 101-150	5	10.0%
Mean of appendix length		70

Table 4 The condition of mesoappendix

Conditions of mesoappendix	Frequency	Percent
Complete	37	74.0
Incomplete	13	26.0
Total	50	100.0

Table 5 Distribution of participants according to Relation with the cecum base

Relation with caecum base	Frequency	Percent
Posterior	39	78.0
Anterior	11	22.0
Total	50	100.0

Table 6 Cross tabulation between the length of appendix, position of appendix head, relation with cecum base and condition of mesoappendix with the sex

		Sex Distribution				P Value
		Female		Male		
		Count	%	Count	%	
Length of appendix	From 101-150	4	8.0%	1	2.0%	*0.02*
	From 30-50	13	26.0%	3	6.0%	
	From 51-100	12	24.0%	17	34.0%	
Position of appendix head	Pelvic	1	2.0%	0	0.0%	*0.46*
	Post hepatic	1	2.0%	0	0.0%	
	Preileal	1	2.0%	0	0.0%	
	Retrocecal	17	34.0%	17	34.0%	
	Retroileal	5	10.0%	1	2.0%	
	Subcecal	4	8.0%	3	6.0%	
Relation with caecum base	Anterior	7	14.0%	4	8.0%	*0.66*
	Posterior	22	44.0%	17	34.0%	
Conditions of mesoappendix	Complete	20	40.0%	17	34.0%	*0.03*
	Incomplete	9	18.0%	4	8.0%	

4. Discussion

Appendicitis is a common medical issue affecting both men and women across all age groups, from childhood to old age. The appendix position is of significant interest due to its evolutionary importance, as well as its relevance in pathology and surgery (**Rahman et al 2019**)

The present study was conducted during the year of 2023, patients who underwent appendicectomy during study period were enrolled in the study and analyzed. 29 (58%) out of 50 were females, while 21were males (42%). Majority of the participants were females this finding agrees with the study conducted by **Bakheit MA et al** in similar population, Sudanese. **Ahmed I et al** reported high incidence for male that contradict our findings. Acute appendicitis was most prevalent (58.0%) in individuals aged 18 to 30 years.

In this study the distribution of the appendix head position was as follow: retrocecal in 68.0%, subcecal in 14.0%, retroileal in 12.0%, pelvic 2.0%, preilial in 2.0% and post hepatic position was observed in 2.0%. in current study, retrocecal position of the appendix was the most common position and accounted for 68.0% of patients, this finding consistent with finding of **Arif et al** who reported 40-65% in his study that involved 350 appendectomy patients in Pakistan. It is also consistent with other studies by Azhagiri et al, Chaudhari et al, and Lamture et al, which also identified the retrocecal position as the most common. This finding contradicts with the finding of Ashindoitiang J.A who reported that pelvic appendix was commonest position in 41.3%, other authors, Jabeen et al found the pelvic position of appendix

to be most common, at 50.8%. Forouzesh et al found that pelvic position was the most common in 29.7% of his study population. These similarities and differences among the studies show that many factors are involved in determining the appendix position. Race can be one of the main factors in all of the studies.

This study shows the average length of 70 mm; this length is shorter than the average length in Ashindoitiang study who measured 115 mm for the appendix length. Arif et al 2023, stated that the mean length of the appendix was found to be 58 mm in males and 52 mm in females. The reason for this is not obvious but appendix length is known to varies between races.

In our study, the mesoappendix was complete in 74.0% of cases and incomplete mesoappendix was observed in 26.0% of our study population. As shown in the study by Gorbani et al incomplete mesoappendix is highest in the age group below 10 years and leads to the severity of appendicitis in childhood. Therefore, in our study, 72.0% of cases were above 18 years, this can be one of the reasons for complete mesoappendix in most cases.

Significant association was found between sex and length of appendix (*p=0.02)* but we did not find any statistically significant association between sex and the position of the appendix head (*p=0.46)*. Also, a larger sample size is needed to make better decisions and to reach a strong confirmation of the association between sex and appendix position and length.

5. Conclusion

In conclusion, the most common position of the appendix among Gezira population, is retrocecal position and in most cases the mesoappendix was complete. Therefore, understanding the various positions of the appendix and its anatomical condition can assist clinicians in earlier diagnosis and providing better treatment for patients with acute appendicitis.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare no conflict of interest related to this work.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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