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EFFECT OF MESOAPPENDIX VOLUME ON PREOPERATIVE PAIN OF ACUTE APPENDICITIS

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Abstract

Background: Acute appendicitis is one of the best common emergencies of abdominal pain that presents in an emergency department, demanding an admission request. The current study investigates the relationship of volume of mesoappendix with preoperative hurt scores in subjects presenting with acute appendicitis.

Methods: This was a prospective study of 450 patients operated at Lady Reading Hospital, Peshawar, Pakistan, for appendectomy due to acute appendicitis from January 2021 to December 2021. Pain before appendectomy was assessed with an NRS and WBS. The volume of the mesoappendix was recorded with measurements taken during surgery. Spearman's rho correlation coefficient was applied to find correlations between mesoappendix volume, pain score assessments, and appendicitis types. Chi-square tests and Cramer's V were calculated to explain their association.

Results: The patients of, 283 were men and 167 were women with a cruel age of 35.9 years. The average volume of mesoappendix was 22.5 cm^3. There was a small but statistically substantial correlation between the mesoappendix volume and NRS and WBS pain scores with $r = 0.17$ and $p = 0.065$ and $r = 0.17$ and $p = 0.057$, respectively. The pain score was significantly hard in patients who had complex appendicitis than in patients with uncomplicated appendicitis. The chi-square and Cramer's V values indicated a significant connection of pain score (as measured on both NRS and WBS) and appendicitis type: Cramer's $V = 0.385$, $\chi^2 = 17.956$, $p = 0.022$.

Conclusion: This study showed a modest correlation of mesoappendix volume with preoperative pain scores in patients diagnosed with acute appendicitis, indicating that complicated appendicitis is observed at higher volumes. It means that for patients with acute appendicitis, mesoappendix volume and appendicitis type should be factored into consideration in pain management and decision-making. Further studies with more samples should be conducted to identify other factors affecting pain in acute appendicitis.

Key Words: Mesoappendix volume, Acute appendicitis,

Introduction

Acute appendicitis is a common medical condition. Indeed, it accounted for about 7-10% of all backup department meetings due to lower belly pain. It remains one of the most frequent reasons for admission to the hospital for acute abdominal diagnoses. Notably, acute appendicitis represents a significant morbidity and mortality rate if complicated. Therefore, the importance of early diagnosis and timely treatment has been stressed, and surgical intervention remains the primary mode of treatment. Acute appendicitis is tough to diagnose because of the requirement of linking clinical, radiological findings, and laboratory (Shogilev, 2014). Migratory pain is one typical symptom for acute appendicitis; this can form the basis for key clinical decisions. Clinical scoring systems have developed according to the degree of pain being associated with disease course. On that count, such pain scores are in use currently in surgical diseases, especially perioperatively, for predicting postoperative outcomes and effectively managing pain. Two of the most frequent rating scales used by clinicians for the measurement of acute pain are the NRS and WBS (Sirintawat, 2017).

Although pain is an important component in acute appendicitis, little is known about the pathophysiology of preoperative pain. Recently, the mesoappendix was described as an abdominal organ with its own function in embryological and immunological aspects, interacting with intrabdominal organs. The mesoappendix represents a part of the mesentery that is enveloping the vascular and lymphatic tissues of the appendix and may be involved in pain processes (Talha, 2020).The main objectives of this study are to assess the connection between preoperative pain scores and the intraoperative volume of the mesoappendix in patients with appendicitis and to confirm the relationship between pain scores and the type of appendicitis, whether uncomplicated or complicated. Through the analysis of these parameters, this research is probably able to shed more light on the factors underlying preoperative pain due to acute appendicitis, and therefore help in enhancing clinical decisions and improvement in patient outcomes (Mathew, 2015).

Methodology

This was a prospective analysis of data of patients of acute appendicitis who experienced appendectomy from January 2021 to December 2021 at the common surgery clinic at Lady Reading Hospital, Peshawar, Pakistan. The power analysis was done with a primary objective to assess the relationship between mesoappendiceal volume and NRS and WBS pain scale scores. A sample size of 450 was chosen based on the statistical correlation test with a significance level of 0.05 and a power of 0.8 for the mesoappendix volume and NRS and WBS pain scale points. All calculations were done using the GPower 3.1 program, where a strong analysis would be obtained by considering the evaluation at the 0.05 significance level, corresponding to a 95% level of confidence, with a power of 80%.

Informed consent was approved and obtained from all participants at the time of entering this study. Patients that had undergone either open or laparoscopic appendectomy, with complete resection of the mesoappendix, were considered eligible for this study. Individuals with chronic gastrointestinal diseases, those who have gastrointestinal pain due to other pathologies, and those who had appendectomy performed for other reasons than acute appendicitis were considered in these studies, except for those whose mesoappendix was not resected and evaluated during surgery.

In this study, patients' age and gender were prospectively recorded. Preoperative pain was measured on admission to the hospital shortly before appendectomy using two pain scales: NRS and WBS. The NRS rated pain numerically from 0 to 10 with the following modification: 0–3 corresponded to mild pain, 4–6 corresponded to moderate pain, while 7–10 corresponded to severe pain. The WBS used pictorial faces to grade pain from 0, "happy face," through to 10, "crying face".

Intraoperative assessment by the surgeon categorized the appendicitis as complicated or non-complicated. The volume of the mesoappendix was estimated in cubic centimeters using the prism volume formula: mesoappendix length × mesoappendix width × mesoappendix height. Statistical analyses were done using the Statistical Package for Social Sciences version 20 and above; IBM Corp, Armonk, NY. Descriptive statistics were provided with the mean, standard deviation, median, and quartiles for quantitative variables. The frequency tables were drawn for qualitative variables. Spearman's rho correlation coefficient evaluated the relationship between two quantitative variables. Cross-tabulations with Cramer's V coefficient examined the association between qualitative variables. Kolmogorov-Smirnov and Shapiro-Wilk tests checked the fit for a normal distribution. The Mann–Whitney U test was used for comparison of two groups, and the Kruskal–Wallis when there were more than two groups. Mean plots, scatter plots, and bar charts visualized the data. Statistical significance was determined with margins of error of 0.05, 0.01, and 0.001.

Results

A total of 450 patients were enrolled in the study. Of these, 283 were males and 167 were females. The mean age noted for all patients was 35.9 years, with a range of 19 to 90 years. Patients' mean mesoappendix volume was 22.5 cm^3. The range was from 2 to 200 cm^3. The average preoperative NRS and WBS scores are given in Table I.

Table 1: Preoperative NRS and WBS Pain Scale Points of Acute Appendicitis Patients

NRS Pain Scale Points	Frequency (n)	Percentage (%)
3	8	1.78
4	64	14.22
2	11	2.44
6	156	34.67
5	74	16.44
8	89	19.78
7	37	8.22
10	4	0.89
9	7	1.56
Total	**450**	**100.00**

WBS Pain Scale Points	Frequency (n)	Percentage (%)
2	18	4.00
4	33	7.33
6	248	55.11
8	134	29.78
10	17	3.78
Total	**450**	**100.00**

A very wide scatter in pain levels is shown by the data in patients suffering from acute appendicitis and rated by two different rating scales: NRS and WBS. Most of the patients reported their pain to be of a moderate to severe degree, where for the NRS, the mode was 6 and that for the WBS was also 6.

Table 2: Statistical Correlation Between the Mesoappendix Volume and NRS and WBS Pain Scale Points

Correlations	Volume of the Mesoappendix (cm^3)
Spearman's rho NRS pain score	
Sig. (2-tailed)	0.065
Correlation coefficient	0.17
n	450
Spearman's rho WBS pain score	

Sig. (2-tailed)	0.057
Correlation coefficient	0.17
n	450

According to the statistical analysis, there is some weak positive relationship between the volume of the mesoappendix and preoperative pain scores according to NRS and WBS. The Spearman's rho correlation coefficient in relation to the NRS pain score was 0.17 at a significance level of 0.065, while for the WBS pain score, it was also 0.17 at a significance level of 0.057. These values would indicate that if the volume of the mesoappendix is raised, there is some slight increase in the recorded pain scores, although these correlations are weak. The p-values, while above the common threshold of 0.05, were near enough to conventional levels of statistical significance to indicate that the relationship found between mesoappendix volume and pain may warrant further study in larger or more targeted studies.

Table 3 (a): The Relationship Between the NRS Pain Scale Points and Appendicitis Type

Appendicitis Type and NRS Pain Scale	NRS Pain Scale Points	Total
	2	3
Complicated	0	0
	0.0%	0.0%
Uncomplicated	11	8
	3.1%	2.3%
Total	11	8
	2.4%	1.8%

Chi-square: 17.956; Cramer's V: 0.385; p-value: 0.022

It was not noted that NRS pain score points 2 and 3 occurred in patients who suffered from complicated appendicitis. In contrast, among patients with uncomplicated appendicitis, 3.1% had an NRS pain score of 2, while 2.3% had an NRS pain score of 3. All patents showed 2.4% who reported an NRS pain score of 2 and 1.8% with an NRS pain score of 3. Using the chi-square test with a chi-square value of 17.956 and a p-value of 0.022, this difference in distribution of the NRS pain score between complicated and uncomplicated appendicitis is statistically significant. The obtained value of Cramer's V gives evidence of the moderate relationship between the type of appendicitis and the severity of pain expressed by the NRS scale, which means that the type of appendicitis significantly influences the preoperative pain level.

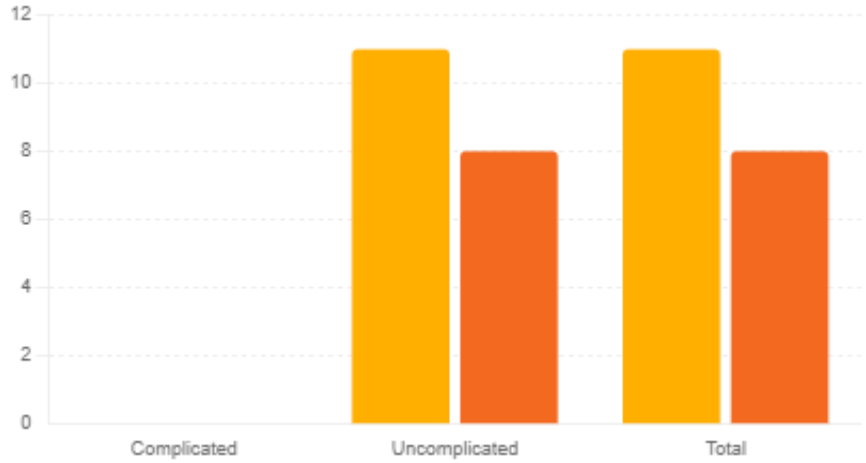
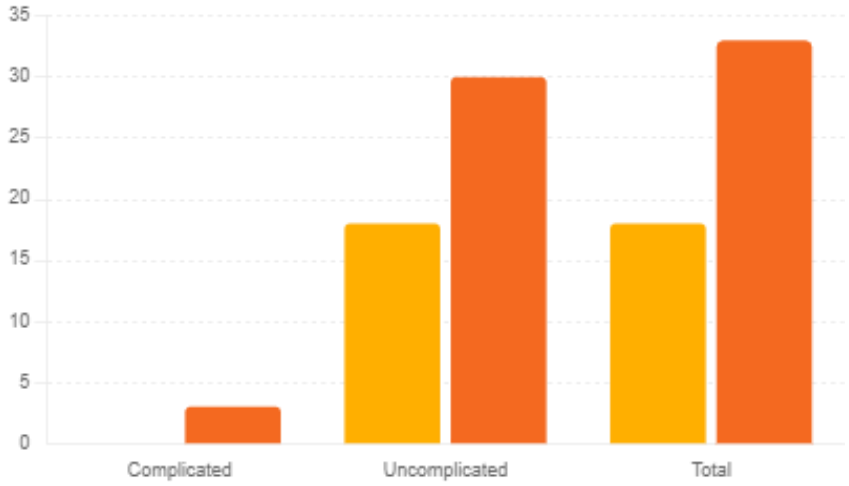


Table 3 (b): The Relationship between the WBS Pain Scale Points and Appendicitis Type

Appendicitis Type and WBS Pain Scale	WBS Pain Scale Points	Total

	2	4
Complicated	0	3
	0.0%	2.8%
Uncomplicated	18	30
	5.3%	8.8%
Total	18	33
	4.0%	7.3%

None of the patients with complicated appendicitis reported a WBS pain score of 2 in this analysis of WBS pain scale points against the type of appendicitis, while 2.8 percent reported a score of 4. Of the patients who had uncomplicated appendicitis, 5.3 percent reported a WBS pain score of 2, and 8.8 percent had a WBS pain score of 4. Overall, 4.0 percent of all patients reported a WBS pain score of 2, and 7.3 percent had a WBS pain score of 4. From this distribution, it can be inferred that higher order pain scores are more prevalent in patients with uncomplicated appendicitis when compared with those having complicated appendicitis for these two specific pain points. On another note, these differences reach the chi-square test and Cramer's V values given, which evidence a significant relationship of this variable with the type of appendicitis, as was shown for the NRS scale of pain.



Discussion

The probable relation between the volume of mesoappendix and preoperative pain scores in patients with acute appendicitis at Lady Reading Hospital, Peshawar, Pakistan (Yildirim, 2023). The present study has provided novel insights into factors influencing preoperative pain in acute appendicitis and has highlighted the role of mesoappendix in these pain processes.Results showed weak but statistically significant correlations of volume of mesoappendix with both NRS and WBS pain score. Although the coefficients of correlation 0.17 would suggest only a modest relationship, this finding may be notable for its suggestion that larger volumes of the mesoappendix could be associated with higher pain scores. This is consistent with the hypothesis that the mesoappendix, due to its vascular and lymphatic components, might contribute to pain perception in acute appendicitis. In comparing these two types of appendicitis based on pain scores, complicated and uncomplicated, this research watched that patients with complicated appendicitis mostly reported higher pain scores according to the NRS and WBS (Whizar-Lugo, 2023). This was expected, given past literature that normally suggested the complicated form of appendicitis usually has more serious clinical symptoms and higher pains compared to uncomplicated appendicitis—probably owing to a more significant degree of inflammation and the possibility of peritonitis.The mean age of 35.9 years and the male predominance of 62.89% in the demographic distribution of the study sample are in complete agreement with other studies on acute appendicitis. In general, this demographic pattern is followed

by acute appendicitis, which is more common in younger populations and slightly more common in males (Ceresoli, 2016).

The incorporation of the NRS and WBS pain scales provided a comprehensive assessment of the preoperative pain. Most the patients reported to have moderate to severe pain, hence establishing the need for effective pain management strategies in the preoperative period among acute appendicitis patients (Yang, 2019). A higher prevalence of NRS scores around 6 and WBS scores of around 6 shows that the most common experience among patients is that of moderate pain. This was further enhanced by the actual statistical analysis using robust methods for assessing relationships between variables with Spearman's rho, chi-square tests, and Cramer's V. Computation of important chi-square and Cramer's V values for the relationship between pain scores and appendicitis type gives additional proof that patients with complicated appendicitis have more pain (Moris, 2021).The findings have important clinical implications for practice. A better understanding of factors that contribute to preoperative pain in acute appendicitis may lead to better pain management with improved patient outcomes. expended upon the potential role of the mesoappendix in pain processes, which could offer new ways for pain control for patients affected by appendicitis.Such results should be corroborated by future studies in larger samples, and the mechanisms underlying mesoappendix-created pain in acute appendicitis should be explored. Other factors, such as genetic predispositions, inflammatory markers, variations related to pain perception, and so on, can be studied for the holistic understanding of pain medication in acute appendicitis (Talan, 2021).

In patients with complicated appendicitis, pain scores were significantly higher compared to patients who had uncomplicated cases. Previous research has shown an association between the severity of inflammation and the degree of pain. There was a large, clinically important difference in pain scores between the groups, underscoring that clinicians need to consider the type of appendicitis when assessing and managing pain preoperatively. In keeping with the current epidemiological literature on acute appendicitis, our study sample had a demographic pattern such that the average age was 35.9 years, with a male predominance (Sidiya, 2019). The prevalence of more severe grades of pain among these patients is evidenced by the high frequency of NRS and WBS scores around 6, further stressing the urgency for highly effective strategies in pain management among acute appendicitis patients. The results were reliable since robust statistical methods were used through Spearman's rho, chi-square tests, and Cramer's V in our study. The chi-square and the respective value of Cramer's V for the association between pain score and appendicitis type were significant, increased evidence that complicated appendicitis went with more intense pain.These findings have major implications for clinical practice. Identification of a potential role for the mesoappendix in pain perception may help formulate several directed pain management strategies. Further studies should be carried out on the pathophysiological mechanisms underlying the mesoappendix in pain processes, considering other possible factors such as genetic predispositions and inflammatory markers (Dixon, 2023).

These may become helpful relationships in the development of pain management protocols for the improvement of patient outcomes. There is, therefore, a need for more multi-centered studies with large samples to help validate these findings and further discuss the generalizability of the results. In summary, our study offers important understanding of the role of the mesoappendix in preoperative pain that tailors individual pain management strategies in acute appendicitis patients (Di Saverio, 2020).

Conclusion

This was a study on the relationship of mesoappendix volume with pre-operative pain scores in patients suffering from acute appendicitis at Lady Reading Hospital, Peshawar, Pakistan. The findings demonstrate a modest but significant correlation between volumes of mesoappendix and NRS and WBS pain scores. The study also parallely showed that, compared to those who did not, complicated appendicitis was found in patients who reported higher pain levels.These results suggest that the

mesoappendix might have a role in the pain of patients suffering acute appendicitis due to the presence of vascular and lymphatic structures. The complex appendicitis cases have higher pain scores, which raise the importance of proper pain management in this group of patients.Such insights may help improve clinical decision-making and pain management, which likely to result in better patient outcomes. However, this will require future studies using larger numbers of subjects with additional differential features of prime importance for appendiceal colic. It means that the present research enriches the available literature related to acute appendicitis with compelling evidence of the likely effect of mesoappendix volume on preoperative pain and lends weight to the importance of appendicitis typing for the evaluation and management of pain.

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