

Discrepancy between the Intra-Operative Diagnosis and Histopathological Evaluation of Acute Appendicitis at a Single Institute in Saudi Arabia; A Retrospective Analysis

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Abstract

Objectives: To determine the accuracy of acute appendicitis diagnosis based on the operative skills documented by intra-operative notes and the histopathological results among variable levels of surgeons.

Methods: Hospital records of 139 patients who were admitted with provisional diagnosis of acute appendicitis from Emergency Department (ED) and operated for appendectomy over 33 months under general surgery department at Qatif Central Hospital, Eastern Province, Saudi Arabia were reviewed retrospectively. All computerized data as well as written files were reviewed including the demographic data (MRN, nationality, age, gender), type of operation, intraoperative notes and histopathology results for appendicular specimen. Age was classified with 15 year-period intervals and the accuracy of the diagnosis was compared to the gender and the type of operation. The accuracy measured based on the matching of the categorization of the intra-operative notes into normal, simple or complicated appendix and the histopathology results which were reported as no significant pathology, appendicitis and suppurative appendicitis, respectively.

Results: The results state that among 139 patients included in the study, 56.1% accuracy rate was found between clinical, operative and histopathological diagnosis regardless of age, gender or type of operation. The discrepancy tends to be more among male patients with 48.9% of inaccuracy. Also, the study showed clear difference in extremes of ages.

Conclusion: To elevate the accuracy of the acute appendicitis diagnosis, many tools should be taken into consideration such as Alvarado scoring, Ultrasonography (US) and Computed Tomography (CT).

Keywords: *Acute Appendicitis Diagnosis; Appendix histopathology; Accuracy of Appendicitis Diagnosis*

Introduction

Appendicitis is a global disease and it is the most common acute surgical abdominal emergency [1,2]. Although there are number of treatment modalities such as medical management, appendectomy consider as the main standard treatment of the acute appendicitis [3].

In UK, over 50.000 emergency appendectomies are performed per annum [4], while more than 250.000 appendectomies are performed each year in the USA with occupation of 1 million hospital days per year [5]. The same study revealed that males tend to have a predominate incidence of appendicitis than females among all age groups with a ratio of 1.4:1 [5]. Another prospective trial that was conducted in 2 centers at UK, Whiston and St Helen's Hospital, revealed a close ratio of 1.1:1 between the incidence of acute appendicitis among males and females, respectively [6].

Coward stated in his results that the rate of acute appendicitis is rapidly increasing and one-third of the patients encounter perforation before the appendectomy [7]. The importance of spot diagnosis is to decrease negative appendectomy rate as well as decrease the possible

morbidity and mortality [7]. Furthermore, many complications can be associated with negative appendectomies which accounts for 10% of post-operative complications [4]. In 1995, Walker, *et al.* stated that due to the limited experience of surgeons and the limited use of antibiotics post-operatively, the complication rate among positive and negative appendectomies was around 21.4% [6].

The negative appendectomies are most likely to occur in female patients due to other mimicking conditions such as gynecological issues [4]. As mentioned in a paper published in UK that 19.1% reported as negative appendectomy among females while 7.2% in males [4].

In 1990, Coward reported in his international, population-based study that was conducted in Europe and North America the initial incidence of appendicitis found to be 75 - 150 cases per 100,000 while 44 - 84 cases per 100,000 found to have accurate diagnosis on pathology report as per the medical registry which encounter children with normal appendix and patients who were treated conservatively and based on that a conclusion of overestimation of the healthcare workers by 15% in order to decrease the risk of misdiagnosis [7].

Furthermore, in term of the comparison between the intraoperative finding and the histopathology reports, A study done in Mysensingh medical college hospital on 1136 patients presented with acute abdomen and clinically diagnosed as acute appendicitis from July 2004 to June 2010 Showed that more than 85% gave a matching result between both intraoperative notes and the histopathology reports [1]. A study reported in Westmead Hospital, Australia, found a close percentage of the previous study with 83.5% matching accuracy [8]. The study added an important part of categorizing the result depending on the qualification of the surgeons (consultants, specialists and residents) and their accuracy in diagnosing the appendicitis with the following percentage of 85, 81.6 and 88.2 respectively [8]. This means that regardless of the surgeon experience, the accuracy of the result will be more than 80% [8]. While another study in the same comparison reports a significant reliability results of more than 98% appendectomies in Inonu University Medical Faculty Department of Surgery [9].

In Kuwait, a study conducted in Mubarak Al Kabeer Hospital, conducted over 2 periods (1982 - 1986) pre-invasion and (1992 - 1996) post-invasion proved the accuracy of around 80% and 84%, respectively [10].

On a national level, a study conducted at King Abdul-Aziz University Hospital, Jeddah, Saudi Arabia between January 2003 and January 2004, only female patients from age 6-64 year-old were included and showed accuracy in diagnosing acute appendicitis of 67.7% with using Alvarado scale, 57.9% with US, 66.7% with CT [11].

Current study is conducted to look for the accuracy and Prevalence of overestimation or underestimation the diagnosis of acute appendicitis in comparison with Histopathology result and to compare the result in Saudi Arabia in a central hospital to local and international studies to estimate the accuracy of clinical judgment and operative skills with the histopathology result.

Methodology

This is a cross sectional retrospective study including 139 patients. Patients from age 8 - 45-year-old with acute appendicitis who were admitted and operated upon in a period of 33 months from January 2015 to October 2018 by general surgeons (Consultants, Specialist and Trainee residents) in the Department of Surgery at Qatif Central Hospital, Saudi Arabia. Patients whose medical records had the required information and who underwent emergency either open or laparoscopic appendectomy were appendectomized and none was treated conservatively were included.

The patient's MRN, nationality, age, sex, type of operation, intraoperative notes and histological results were recorded based on the computerized data in addition to the written files. The medical records reviewed and the data was entered to a computer database. Furthermore, This Study classified the results, depending on patients ages, according to new novel classifications for ages reported by King Saud University which is child age (0 - 15), young adults (15 - 30), middle aged adults (31 - 50) and senior age (> 50) [12].

Appendiceal inflammation was classified intraoperatively into 3 categories (Normal, Simple and Complicated) as appreciated by the surgeons based on the universal definition. Simple appendicitis includes mild and moderate inflammation. It is defined as prominent

vasculature of the appendix without any change in consistency and the diameter of the organ and no pus formation or fibrin deposition. While increasing in the size of the vasculature with the hardening of the appendix indicates moderate inflammation. Complicated appendix defined as perforation of the appendix, empyema or abscess formation with or without fecal peritonitis [4].

The histopathologist has also 3 categories according to their reports (no significant pathology, appendicitis with periappendicitis, suppurative appendicitis) as represented in table 1.

Intraoperative notes		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Complicated Appendix	35	25.2	25.2	25.2
	Normal Appendix	2	1.4	1.4	26.6
	Simple Appendix	102	73.4	73.4	100.0
	Total	139	100.0	100.0	

Table 1: The classifications of appendix based on the surgeons finding during the operation.

Statistical analysis

The results were compared based on the frequency and accuracy using the statistical package for Social Sciences, SPSS for MAC OS (version 1.0.0 - 2740).

The accuracy of the pathological assessment was correlated with type of operation, age and gender. which is represented in table 2-4 respectively.

			Type		Total
			Laparoscopic	Open	
Accuracy	Accurate	Count	26	52	78
		% within Type	56.5%	55.9%	56.1%
	Not Accurate	Count	20	41	61
		% within Type	43.5%	44.1 %	43.9%
Total		Count	46	93	139
		% within Type	100.0%	100.0%	100.0%

Table 2: The relation between the type of operation and the accuracy.

			Age			Total
			<= 15	16 - 30	31 - 45	
Accuracy	Accurate	Count	24	28	26	78
		% within Age	57.1%	51.9%	60.5%	56.1%
	Not Accurate	Count	18	26	17	61
		% within Age	42.9%	48.1%	39.5%	43.9%
Total		Count	42	54	43	139
		% within Age	100.0%	100.0%	100.0%	100.0%

Table 3: The age classification and the percentage of accuracy among each group of ages.

			Gender		Total
			F	M	
Accuracy	Accurate	Count	32	46	78
		% within Gender	65.3%	51.1%	56.1%
	Not Accurate	Count	17	44	61
		% within Gender	34.7%	48.9%	43.9%
Total		Count	49	90	139
		% within Gender	100.0%	100.0%	100.0%

Table 4: The percentage of accuracy based on the gender.

Results

This paper is looking for the accuracy and matching of the intraoperative notes regardless of the classification of normal, simple and complicated appendix and regardless of the histopathology results classification of no significant pathology, appendicitis and suppurative. Then, it is categorized into accurate if the results matched or not accurate if there is discrepancy between the results.

Our study is taking place in the period from January 2015 to October 2018. Data of MRN, nationality, age, sex, type of operation, intra-operative notes and histopathology results were obtainable on 139 out of 168 (82.74%) patients who were operated for appendectomies at Qatif Central hospital, Eastern Province, Saudi Arabia. These patients were in an age range between 8 and 44 years old. The number of female patients were 49 with mean age of 25 years while the number of male patients were 90 with mean age of 23 years. Out of those, 46 has been done laparoscopically and 93 with open appendectomy approach. The accuracy of diagnosis of acute appendicitis among females for all age groups is 32 cases which represents a percentage of 65.3% of all female cases while among male patients is 46 cases which is 51.1%. In term of accuracy based on the type of operation, we found that 52 patients who underwent open appendectomy which represents 55.9% and 26 of cases were done laparoscopically with percentage of 56.5%.

Prevalence of complicated appendicitis was 25.2%, simple appendicitis 73.4% and normal appendix 1.4% as showing table 1.

Discussion

Qatif Central Hospital is one of the main hospitals of secondary care affiliated by ministry of health with more than 350 beds capacity. The number of surgeries done in an average of more than 2000 operations yearly with an average number of 25 appendectomies per year.

In this study, medical records of those who underwent appendectomies over 33 months were evaluated for discrepancy between clinical judgement and the final pathological result.

The accuracy and discrepancy in our study was compared with those reported in the literature. Accuracy of acute appendicitis diagnosis in Qatif Central hospital was 56% among studied patients regardless of the type of operation with p value of 0.946 and up to 44% represents the inaccuracy which may reflect the limited experience of the surgeons as most of those who operate on the patients were trainee and first on call surgeons. While in the literature, a percentage of more than 80% was reported [1,6-9]. Our study, unlike other studies, showed that the percentage of accuracy tends to be higher among females up to 65.3% unlike in males with high false negative appendectomies 48.9%. These negative appendectomies in males was unexpected as never reported in previous studies [4]. The expectation from other studies is to have higher percentage of negative appendectomies among female population due to the female anatomical and physiological differences that result in many differential diagnosing of acute abdomen. In the other hand, we found a clear difference in extreme ages in accuracy as proved in one of the previous study where they found the same results [10].

Overall, our study founds unexpected disagreement between the general surgeons and the pathologist for which this paper recommends careful analysis and documentation of each case coming to emergency whether it is typical or atypical presentation before sending them to operation room. The detailed history, vitals record, delicate examination, the radiological evaluation and the final Alvarado scoring should be considered.

Conclusion

This study analyzed the data from Qatif Central Hospital, Eastern province, Saudi Arabia for the accuracy in diagnosing acute appendicitis and concluded that 78 out of 139 of the cases that accounts for 56% were accurately diagnosed while 44% showed discrepancy between clinical and pathological diagnosis of acute appendicitis. The conclusion states a significant difference in the accuracy of p-value (0.946) of types of operations among the whole sample. However, open appendectomy tends to record double matching result than what laparoscopy does (2:1).

In future studies, we will extend this study to include other highly specialized and standard hospitals in Saudi Arabia to evaluate the result over a national level.

Documentation plays a major rule in the accuracy of any study and research which is one of the most fundamental element to be focused on in the coming future studies.

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