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Review Article

Clinical, Laboratory, and Radiological Differentiation Between Acute Appendicitis and Acute Mesenteric Adenitis in Paediatrics: A Literature Review

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Abstract

Acute mesenteric lymphadenitis (ML) has a clinical presentation very similar to that acute appendicitis (AA) which makes the differentiation between both diseases challenging to the clinicians and physicians. The aim of this literature review is to investigate the patterns of presentation of acute appendicitis and mesenteric lymphadenitis in order to find any helpful insights into the clinical and radiological diagnosis and further management plans. Clinically, children with ML tend to be less nauseous, have less episodes of vomiting, and report migration of pain from the abdomen to the lower right quadrant area less frequently than patients with AA. Patients with AA have higher leucocyte count, neutrophil percentage, and serum C-reactive protein, while ML have higher lymphocyte count. However, these findings do not provide accurate differentiation between both disorders. Clinical scores of acute appendicitis such as Alvarado score give a more accurate diagnostic value than clinical examination with a positive predictive value of 0.81, however, it is not enough to reach a perfect accuracy. Noteworthy, additional radiological assessment shows a more reliable diagnostic performance than clinical examination and clinical scores with a positive and negative predictive values of 0.96 and 0.96, respectively. Till a more perfect test has been provided or found, additional radiological examination in addition to the clinical and laboratory data is considered the best approach to differentiate between AA and ML.

Keywords: *Acute Appendicitis; Mesenteric Lymphadenitis; Mesenteric Adenitis; Children*

Abbreviations

AA: Acute Appendicitis; ML: Mesenteric Lymphadenitis; CRP: C-Reactive Protein; RLQ: Right Lower Quadrant; MA: Mesenteric Adenitis

Introduction

Acute appendicitis (AA) is considered the most common surgical emergency in the pediatric population, however, the accuracy in clinically-diagnosing these patients continues to be a challenge to physicians and clinicians. The clinical presentation of acute mesenteric lymphadenitis (ML) is the nearest among other diseases presenting with acute abdominal pain in mimicking AA and therefore its often quite difficult to differentiate between both disorders [1-4]. Moreover, Acute ML has been a common finding during negative surgical explorations in patients suspected of having acute appendicitis [5]. However, acute mesenteric lymphadenitis has a self-limiting course. It is important to reach an accurate diagnosis prior to the management-decision phase, therefore negative explorations for suspected acute appendicitis should be kept to a minimum.

Some reports support the use of various clinical scoring system such as the Alvarado score to help in the diagnosis process of acute appendicitis, [6,7] while other reports promote the use of additional radiological imaging [8] whilst other suggest using both for better diagnosing accuracy [9,10].

Due to the sparse clinical studies and reports that differentiate between acute appendicitis and acute mesenteric lymphadenitis in terms of clinical, laboratory, and radiological parameters in those patients [1,4,11] we conducted the current literature review in order to investigate both disorders and to highlight any discriminating patterns between them for better diagnostic process and management care.

Presentation of mesenteric adenitis and lymphadenitis

Tenderness at initial presentation has been reported in 100 of cases of mesenteric adenitis [12]. On the other hand, a tenderness that is localized to the RLQ region has been observed in 78.9% of patients [4]. Noteworthy, migration of pain to the RLQ area of the abdomen has been reported less frequently than in patients with acute appendicitis with an occurrence rate of 7.1 to 13.2%. Nausea and vomiting has been observed in 14.4 - 65.8% and 25 - 47.4% of patients [1,4,12]. Whereas, anorexia was observed in 29.3% to 55.8% of patients. On the other hand, the history of diarrhea is positive in 20 to 80% of patients with MA. A total of 28.3 to 75% of patients present with fever than is higher than 37OC [1,12]. On physical examination, no characteristic finding was noted to be associated mainly with the presentation of mesenteric adenitis. However, abdominal guarding is observed in 5.3% of patients, while signs of acute appendicitis were noted positive in 20.2% of the population [1].

Presentation of acute appendicitis

The presentation of acute appendicitis varies substantially according to the age group. During early childhood, the presentation of AA would be atypical which would subsequently result in a difficulty in its diagnosis. The reason behind that lies in the poor communication skills of this age group which would result in the understanding of the disease process. The variability in the clinical presentation in the various age group is well comprehended by the anatomical variation and pathophysiological differences responsible for AA. These factors are of substantial concern to the physicians and highlight the need to properly investigate this subset of patients in order to reach a successful management protocol.

Infants (Less than 3 years of age)

The dominating symptoms in this age group are vomiting which is observed in 85% to 90% of patients, right lower quadrant (RLQ) pain (35% to 81%), fever (40% to 60%), and diarrhea (18% to 46%). Other common manifestations in this subset of patients are irritability (35% to 40%), cough (40%), grunting respiration (8% to 23%), restriction in right hip joint mobility, pain and lumping in 3% to 23% of patients. Given the fact that vomiting is reported by the majority of patients in this age group, it is still considered as a vague, non-specific symptom which also occurs in many other disorders at this age such as gastroenteritis, mesenteric adenitis, otitis media,

intussusception, and upper respiratory tract infection [13]. Noticeably, the majority of patients on the physical examination have a body temperature that is higher than 37oC (87% to 100%); diffuse abdominal tenderness (55% to 92%); localized RLQ pain that is observed in less than the half of presenting patients [14-16].

Children (3 years of age and older)

Nausea, vomiting, anorexia, focal pain at the RLQ region, and the fever has been the most commonly reported symptoms in this age group [14,17,18]. Nausea has been reported to occur in 16.7% to 89.9% of patients; vomiting in 61.8% to 75.4% of patients; anorexia in 44.1% to 75% of patients with acute appendicitis. On the other hand, the sensation of pain localized to the RLQ area of the abdomen has been the presenting symptom in 74% to 84.8% in this age group. Remarkably, migration of pain to the RLQ region has occurred in a minimal subset of patients ranging from 26.6% to 40.6%. Occurring at a much lesser extent, diarrhea has been reported to occur in 16% to 18.6% of patients [1,4,17,19]. In terms of observations on physical examination, limping, maximal tenderness at RLQ region, and guarding are the most common observations in patients with acute appendicitis, occurring at a rate of 82%, 82% to 84.8%, and 41.8% to 65%, respectively [17-19]. As for appendicitis signs, psoas sign has been observed in 21.5% to 30% of patients, while Rovsing sign and obturator sign have been observed in 26% to 31.7% and 23% of patients, respectively [17,19]. On the contrary, in another population, positive Rovsing's sign and psoas sign were observed in over 90% of patients [20]. Remarkable to say, signs of acute appendicitis, collectively, has been positively noted in 72.3% of patients [1].

Similarities in clinical and laboratory data between ML and AA

A wide spectrum of overlapping occurs in a wide variety of symptoms between acute appendicitis and mesenteric adenitis/lymphadenitis. Even though the presentation of non-specific symptoms such as nausea, vomiting, and migration of pain from the abdomen towards the right lower quadrant is less frequent in mesenteric lymphadenitis, this does not necessarily rule out the possibility of having MA [1,4,12,17,19]. Similarly, the frequency of presenting with diarrhea and fever is higher in patients with mesenteric lymphadenitis compared to acute appendicitis, however, these symptoms are not limited to MA solely. The same goes for signs of acute appendicitis such as positive obturator, Rovsing's, and psoas signs; during a physical examination, the majority of patients with acute appendicitis show positive signs (72.3%) [1]. However, a fifth of a population with mesenteric lymphadenitis show positive appendicitis signs [1]. Remarkable to mention, no significant association between ML and signs and symptoms of upper respiratory tract infection (URTI) was noted [1,4] even though initial reports found a correlation between both clinical entities [21]. Therefore, the clinical diagnosis of these conditions based mainly on the symptomatology could be quite misleading.

Differentiation between AA and ML in terms of clinical presentation, laboratory data, and radiological findings

A clear guide on how to diagnose ML and AA as a separate clinical entity based on the clinical presentation, laboratory, and radiological assessment is not provided in the literature due to the sparsity of clinical research and data on these conditions. As ML is the most common entity mimicking AA, the differentiation between acute appendicitis and mesenteric lymphadenitis remains essential in order to successfully highlight any special patterns in the presentation of each disease [2,3,5,22,23].

Clinically, children with ML tend to have a longer duration of symptoms prior to presentation and therefore tend to have multiple presentations and have longer durations of stay in the emergency department [1]. They are also younger, less nauseous with fewer episodes of vomiting, and reported migration of pain to the RLQ less frequently than patients with AA [4]. On the other hand, patients with AA have significantly more rebound tenderness and abdominal guarding. From a laboratory perspective, patients with AA have significantly higher leucocyte count, neutrophil percentage, and serum C-reactive protein (CRP) levels [1,4] while the role of lymphocytosis as a negative predictor of AA with a strong association with ML has been supported in the literature [1]. The importance of high leucocyte count, elevated CRP [24,25] and neutrophil to lymphocyte count ratio in reaching the diagnosis of AA has been previously demonstrated [26-28]. Given the differences in the aforementioned symptoms and laboratory data, these data provide a very useful insight into diagnosis AA and ML,

however, they remain unable to provide a criterion accurate enough to diagnose these conditions, as the positive predictive values of the clinical diagnosis of AA and ML are 0.62 and 0.42, respectively [4].

Clinical scores have been a useful tool in the diagnosis process of AA such as the Alvarado score and the pediatric appendicitis scores to increase the diagnostic accuracy of this condition and subsequently help the clinician determine the appropriate management, [6,7] and the accuracy of these scores have been validated previously in the literature [9,10,29]. However, there is very minimal data about the accuracy of these scores in differentiating AA from mimicking conditions such as ML. A recently conducted study estimating the accuracy of the Alvarado score in differentiating AA from ML, based on the prospectively scored data, revealed a positive predictive value of 0.81 for acute appendicitis, which remains higher and provides better diagnostic implication than the clinical data [4]. The authors also developed a logistic regression model in order to estimate its diagnostic performance in differentiating between the two clinical entities based on a combination of clinical variables, however, its positive predictive value was 0.79, lower than that of the clinical scoring system Alvarado. Again, these score systems and prediction models do not provide sufficient accuracy to diagnose patients correctly, as they would lead to an unacceptable amount of negative explorations.

Noteworthy, additional radiological assessment have shown a more reliable diagnostic performance than clinical examination and scoring system with a positive predictive value and negative predictive value of 0.96 and 0.96, respectively [4]. Mesenteric lymphadenitis, therefore, can be diagnosed quite accurately using ultrasound mainly or computed tomography (CT) and is also a common finding when patients undergo radiological imaging where there is a clinical suspicion of AA. Therefore, some patients can be spared a negative exploration. This is quite important as negative explorations for suspected appendicitis carry a real risk of morbidity with an increase in hospital costs [30]. Even though CT shows better accuracy than ultrasound in diagnosing patients presenting with acute abdominal pain who are suspected of having AA, however, there is substantial evidence that ionizing radiation to children while performing CT increases the lifetime mortality risk from cancer [31]. So, abdominal CT scanning in the pediatric population should be used with caution and avoided whenever possible and that abdominal ultrasound would be the most preferable primary examination of choice in these cases [4,8,32].

Gaps in the current literature regarding the management of ML

That being said, the optimum management criteria for ML remain challenging as most of the time there is no clear cause, that's why its treatment remains controversial and require more studies to delineate its natural history. The etiology of mesenteric adenitis could be primary (idiopathic) or secondary to infectious, malignant, or inflammatory disorders [33]. Among the most common causes are intestinal infections caused by viruses such as influenza, adenovirus, coxsackie B and human immunodeficiency virus (HIV), or bacteria such as *Yersinia enterocolitica* and *Y. pseudotuberculosis*, besides *Mycobacterium tuberculosis, Salmonella* species, and *S. typhi* [34-36] and treatment depends on the underlying pathology. Therefore, if the etiology is of a viral origin, then symptomatic medications such as analgesics and anti-inflammatories should be prescribed until the body eliminates the virus, [37] and if the infection is of bacterial origin, it may be advisable to use antibiotics in addition to the symptomatic drugs [33].

Conclusion

Mesenteric adenitis/lymphadenitis and acute appendicitis in the pediatric population has a wide range of overlapping symptoms which hinders the process of clinical diagnosis. Even though there are differences in the clinical presentation and laboratory data (leucocyte count, lymphocyte percentage, neutrophil count, and CRP) between the two clinical entities, but depending solely on them would result in a significant number of negative explorations. Clinical scoring systems are of more beneficial value in guiding clinicians in the diagnosis process besides the clinical presentation, however, they remain insufficient to provide an accurate diagnosis of both conditions. Therefore, we think it is best to add radiological examination to the routine diagnosis process to add more accurate diagnostic value in differentiating between ML and AA till a perfect test that is more accurately reliable would be found.

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Conflict of Interest

None.

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