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Alvarado score: a guide to computed tomography utilization in appendicitis

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Abstract

Background: Although useful in evaluation of suspected appendicitis, not all patients require computed tomography (CT) evaluation. Clinical stratification of patients who benefit from CT evaluation is essential. We utilize the Alvarado score (AS) to stratify patients with suspected appendicitis into subgroups who benefit from CT evaluation and propose an objective algorithm with AS guiding CT utilization.

Methods: This study is a retrospective review of medical records of all patients admitted for suspected appendicitis over a 6-month duration. Relevant data were recorded. The AS for each patient was determined retrospectively and correlated with histological and CT findings. The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were determined for various ASs and for CT.

Results: Three hundred fifty-eight patients were studied, with 167 males (46.6%) and 191 females (53.4%). Prevalence of appendicitis was 50% (179 patients). Two hundred fourteen patients (59.8%) had CT performed. Surgery was performed for 206 patients (57.5%). Overall negative appendicectomy rate was 13.1%. Patients who underwent CT evaluation had a negative appendicectomy rate of 5.7% compared to 17.9% in those without CT evaluation ($P = 0.009$). CT scan had a sensitivity and specificity of 92.6% and 96.9%, respectively. An AS greater than 3 had a sensitivity superior to CT (95.5%), while an AS of 9 or greater had a specificity superior to CT (100%).

Conclusions: In suspected appendicitis, patients who benefit from CT evaluation are those with the AS ranging from 4 to 8. We propose a management algorithm with the AS guiding the necessity for CT evaluation.

Introduction

Acute appendicitis is one of the most common causes of acute abdominal pain requiring surgical intervention, with a lifetime risk of 8.6% for males and 6.7% for females.[1,2] Although easily managed with appendicectomy, surgery is associated with a risk of post-operative complications ranging from 2% to 23%.[3,4] In the long term, 3% of post-appendicectomy patients also suffer the sequelae of intestinal obstruction secondary to post-operative adhesions.[5,6] It is thus prudent to minimize negative appendicectomy rates.

Computed tomography (CT) scan has emerged as the dominant imaging modality for evaluation of suspected appendicitis in adults.[7] The use of CT has decreased negative appendicectomy rates to less than 10%.[8–10] It is a valuable tool in the evaluation of suspected appendicitis, with sensitivity and specificity ranging from 80% to 100%.[11–15] However, the radiation exposure with CT poses a concern, particularly in appendicitis which predominantly occurs in young patients most susceptible to the adverse effects of radiation.[16] CT has also been criticized to increase hospital costs and delay therapeutic intervention.[17,18] Thus, the challenge to the clinician is to determine the subset of patients best served by CT evaluation. Clinical algorithms for the management of suspected appendicitis have been proposed.[19,20] These algorithms recommend CT evaluation for clinically equivocal cases of suspected appendicitis but fail to objectively define this group of patients. An objective determinant of clinically equivocal cases of suspected appendicitis that benefit from CT evaluation will be immensely useful.

The Alvarado score (AS) is a 10-point clinical scoring system for acute appendicitis that has been extensively validated both in the adult and in the paediatric population (Fig. 1).[1,21–24] It encompasses the symptoms, signs and laboratory investigations which surgeons