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Assessment of ultrasonography and computed tomography in the diagnostic strategy of suspected appendicitis

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“Anyone who travels across the international surgical world is exposed to outdated practices entrenched within old local myths. Be it the developed or developing world, in outlying hospitals or ivory towers - the scenario is identical: a shrug of the shoulder followed by a remark in whatever local language or dialect: Oh, this is how we do it”

MOSHE SCHEIN IN 'COMMON MYTHS IN SURGERY'
SURGICAL ROUNDS 2004; 34-38

Introduction - outline of the thesis

The diagnosis of acute appendicitis remains an important and controversial problem in modern medicine. The initial management of patients with suspected appendicitis needs to be based on the disease history, physical signs, and basic laboratory tests. However, based on these clinical signs and symptoms, the negative appendicitis rate can be as high as 15-40%. In order to prevent a delay or error in diagnosis, which often results in advanced disease with perforation and a marked increase in complication rate, these negative appendectomy rates are generally accepted. On the other hand, the removal of a normal appendix has considerable complications and costs. To improve diagnostic accuracy, graded compression ultrasonography (US) and CT have been considered accurate imaging techniques for detecting acute appendicitis. Over the years, numerous studies on the impact of US and CT on negative appendicitis and perforation rates have been published. Most of these studies show, especially for CT, a significant reduction of the prevalence of negative appendicitis. Yet other significant studies cannot confirm these results leading to the conclusion that the liberal use of appendiceal CT may not contribute to reducing negative appendicitis rates. It is suggested that these conflicting results are caused by the variety in patient population, research protocols and research-based settings.

Although in most studies CT was found to have a better test performance than US, several authors have advocated the use of US as primary imaging modality, certainly given the negative exposure to radiation in this generally young patient population.

In patients with atypical signs and symptoms, acute appendicitis can also be managed by clinical observation besides additional imaging and diagnostic laparoscopy. The aim of this thesis is to assess the different aspects of the use of imaging, especially US and CT, in patients with suspected appendicitis.

In **Chapter 2** a historical review is completed. The role of clinical scoring systems, US, CT, MRI and diagnostic laparoscopy are being described as well as the impact of these imaging modalities on the management of appendicitis throughout the years.

In **Chapter 3**, the accuracy of CT and graded compression ultrasonography are compared for a diagnosis of acute appendicitis in patients with suspected acute appendicitis at a general, community teaching hospital. One of the disadvantages of graded compression ultrasonography is the fact that it is operator-dependent and thereby requires a high level of skill and expertise. Yet, for CT it is also hold that especially those institutions without in-house and dedicated body imaging radiologists, may not be able to duplicate high diagnostic accuracy rates of CT in acute appendicitis.

In **Chapter 4** we evaluate the influence of expertise on the interpretation of CT images for acute appendicitis. This was done by comparing the accuracy of computed tomography (CT) analyzed by individual radiology staff members and body imaging radiologists in a non-academic teaching hospital for the diagnosis of acute appendicitis. CT has significant benefit for diagnosing women as it leads to a significant lowering of the negative appendicitis rate, thereby revealing the validity of alternative diagnoses that can mimic acute appendicitis. In Chapter 3, the overall diagnostic accuracy of US and CT in acute appendicitis is described, yet the reported study does not differentiate between women and men; also no comparison is made between US and CT regarding alternative diagnoses made at surgery and findings by imaging.

In **Chapter 5**, a reevaluation of these data regarding the impact of gender on the negative appendicitis rate and the performance of US and CT in the diagnosis of acute appendicitis is given. In addition, the accuracy is assessed of using US and CT in diagnosing clinically relevant, alternative disorders mimicking appendicitis in both men and women.

Studies conflict whether the negative appendectomy rate can be decreased with the regular use of US and CT. Although in most studies CT was found to have a better test performance than US, several authors have advocated the use of US as primary imaging modality, certainly given the negative exposure to radiation in a generally young patient population.

In **Chapter 6**, the roles of US, diagnostic laparoscopy and clinical observation in fertile women with acute pain in the right lower abdomen suspected of acute appendicitis were evaluated. Because a negative US result cannot rule out appendicitis, all women in this study with typical signs and symptoms underwent surgery, regardless of US results. Women with an atypical clinical presentation and negative US results were observed. To determine the influence of US and CT in lowering the negative appendicitis rate in patients with suspected appendicitis, a further study was undertaken to evaluate a diagnostic pathway for appendicitis using graded compression US as well as CT. In **Chapter 7** the results of a diagnostic pathway are described: patients underwent surgery after a primary performed positive US or after complementary CT when US was negative or inconclusive. Patients with positive CT findings underwent surgery. When CT was negative for appendicitis, they were admitted for observation. To make an inventory of the opinions held by Dutch surgeons concerning the use of ultrasound and CT in patients with the clinical suspicion of acute appendicitis, a written survey was carried out among all members of the Association of Surgeons of The Netherlands. The results of this survey are described in **Chapter 8**. **Chapter 9** summarizes the findings of this thesis and presents the implications of this thesis. **Chapter 10** is a Dutch summary.