



## Original Article

# Appendiceal location analysis and review of the misdiagnosis rate of appendicitis associated with deep pelvic cecum on multidetector computed tomography



Gil-Sun Hong, Choong Wook Lee\*, Mi-hyun Kim, Cherry Kim

Department of Radiology and Research Institute of Radiology, University of Ulsan College of Medicine, Asan Medical Center, 88, Olympic-ro 43-gil, Songpa-gu, Seoul, 138-736, Republic of Korea

## ARTICLE INFO

## Article history:

Received 20 September 2015

Received in revised form 21 January 2016

Accepted 17 February 2016

## Keywords:

Deep pelvic cecum

Appendicitis

Misdiagnosis

Multidetector computed tomography

## ABSTRACT

**Objective:** To investigate appendiceal location and misdiagnosis rate of appendicitis associated with deep pelvic cecum on multidetector computed tomography (MDCT).

**Materials and methods:** Among 1107 appendicitis cases, 25 patients with deep pelvic cecum and 75 patients with conventional cecum on MDCT were retrospectively selected for analysis of appendiceal locations and pre-operative misdiagnosis rate.

**Results:** The major appendiceal direction in deep pelvic cecum group was ascending (84.0%). The misdiagnosis rates of appendicitis in deep pelvic and conventional cecum groups were 16% and 5.3%.

**Conclusion:** A deep pelvic cecum may cause misdiagnosis of appendicitis. The appendix associated with deep pelvic cecum mainly demonstrates right ascending direction.

© 2016 Elsevier Inc. All rights reserved.

## 1. Introduction

Acute appendicitis is the most common cause of acute abdominal pain and requires surgical treatment [1,2]. Multiple studies emphasize the usefulness of multidetector computed tomography (MDCT) for diagnosing acute appendicitis, as it is a highly accurate and effective cross-sectional imaging technique for this purpose. Helical computed tomography (CT) and MDCT demonstrate sensitivity values of 90–100%, specificity values of 91–99%, positive predictive values of 92–98%, and negative predictive values of 95–100% for the diagnosis of appendicitis [2–4]. The reported false-negative rates for diagnosing acute appendicitis using MDCT are as high as 7% [5,6]. However, the misdiagnosis of appendicitis still occurs in atypical cases.

The cecum is a mobile structure that can change its abdominal position due to variations in its attachment to the posterior peritoneum [7–9]. Cecal malposition is an important cause of the misdiagnosis of appendicitis, as it changes the appendiceal location and causes atypical symptoms [10–14]. The presence of a freely mobile cecum in the right colon reportedly affects 10–20% of people according to previous autopsy series [8,15,16]. A pelvis is usually divided into two parts: a false and true pelvis. The true pelvis is the space between the pelvic brim and

pelvic floor, which contains pelvic colon, rectum, bladder and some of the sex organs [17]. Unlike the conventional cecum located on the iliacus muscle in the false pelvis, the mobile cecum sometimes extended into the deep true pelvis [18]. In some cases in the previous studies [11,15,19], the mobile cecum located in the deep true pelvis (i.e., deep pelvic cecum) causes the misdiagnosis of appendicitis on MDCT or ultrasonography. In our anecdotal experience, the appendiceal location in patients with a deep pelvic cecum seems to differ from the typical location pattern of the vermiform appendix. However, to the best of our knowledge, there are no reports that have assessed the appendiceal location in the deep pelvic cecum.

The objective of our current study therefore was to analyze the typical location pattern of the appendix in patients with the deep pelvic cecum and review the misdiagnosis rate of acute appendicitis on preoperative radiological reports.

## 2. Methods

### 2.1. Study population

This retrospective study was approved by our institutional review board, and the requirement for informed consent was waived. One board-certified emergency radiologist (C.W.L.) reviewed the pathological and medical records at our single tertiary-care center of patients treated between January 2000 and December 2012 and identified 1107 adult cases with pathologically confirmed appendicitis who underwent preoperative abdominal MDCT at the emergency department. In consensus,

\* Corresponding author. Department of Radiology and Research Institute of Radiology, University of Ulsan College of Medicine, Asan Medical Center, 88, Olympic-ro 43-gil, Songpa-gu, Seoul, 138-736, Republic of Korea. Tel.: +82-2-3010-4355; fax: +82-2-476-0090.

E-mail address: [cwlee@amc.seoul.kr](mailto:cwlee@amc.seoul.kr) (C.W. Lee).

two board-certified emergency radiologists (G.S.H. and C.W.L.) reviewed the MDCT images of these 1107 patients to find the deep pelvic cecum (i.e., cecum extending downward into the deep true pelvic cavity on MDCT) based on MDCT image criteria. As a result, 25 patients (21 women and 4 men; mean age = 34 years; age range = 20–61 years) were identified with a deep pelvic cecum and retrospectively enrolled in our current study. For the control group, we randomly selected 75 patients with a conventional cecum (44 women and 31 men; mean age = 43 years; range = 22–61 years) from the remaining 1082 patients.

## 2.2. CT techniques

Intravenous, contrast-enhanced abdominal and pelvic examinations were performed using LightSpeed Plus (GE Healthcare, Milwaukee, WI, USA), LightSpeed Ultra 16 (GE Healthcare, Milwaukee, WI, USA), Somatom Sensation 16 CT scanners (Siemens Healthcare, Erlangen, Germany), or the Somatom Definition AS-Plus (Siemens Healthcare, Erlangen, Germany) CT scanner. Each patient received 100–120 ml iopromide (Ultravist 300 or Ultravist 370; Bayer Schering Pharma, Berlin, Germany) that was administered at a rate of 3.0 ml/s through the antecubital vein. Portal venous-phase images were obtained from the dome of the diaphragm to the pubic symphysis at 72–100 s after the initiation of intravenous contrast injection. The CT protocols varied because of the long interval over which the cases were collected. However, the axial images of all patients were reconstructed with a section thickness of 5 mm and an interval of 5 mm. Coronal reformations were reconstructed at a thickness of 5 mm in 14 patients in the deep pelvic cecum group and 29 patients in the conventional cecum group. All images were reviewed using DICOM image-viewing software.

## 2.3. Review of the preoperative reports and image analysis

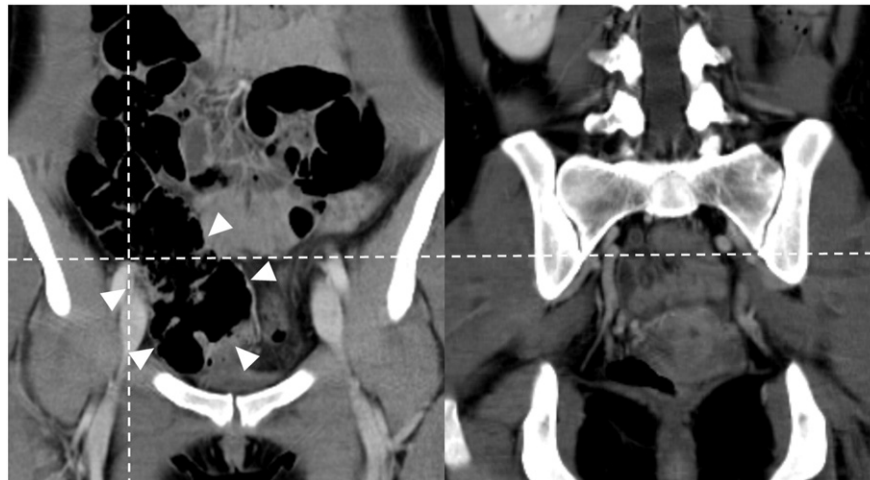
Two board-certified emergency radiologists (G.S.H. and C.W.L. with 8 years and 15 years of clinical experience using abdominal MDCT, respectively), who were blind to the patient clinical information, reviewed the axial and coronal contrast-enhanced MDCT images in consensus and identified the deep pelvic cecum. Based on MDCT, we defined the deep pelvic cecum as follows: the blind pouch of the cecum was located (1) below the inferior margin of the right sacroiliac joint and (2) on the left side of the medial margin of the right psoas muscle (Fig. 1). In consensus, two board-certified emergency radiologists (G.S.H. and C.W.L.) evaluated mixed cases in a randomized reading order, which consisted of patients with a deep pelvic cecum and

conventional cecum, and determined the direction and position of the appendix. On the basis of the previous papers [18,20,21], the direction and position of the appendix were defined as follows (Fig. 2). The direction of the proximal appendix from the appendiceal base was divided into three classes: ascending (going upward from the appendiceal base), transverse (going horizontally toward the sacrum at the level of appendiceal base), or descending (going vertically or medially downward below the appendiceal base). The position of the appendiceal tip was classified into five categories: retrocecal (behind the cecum and the ascending colon), subcecal (vertically below the cecum), pelvic (inside the deep true pelvis), preileal (in front of the terminal ileum), or postileal (behind the terminal ileum).

One emergency radiologist (G.S.H.) reviewed the preoperative reports to determine the false-negative diagnostic rate of appendicitis using MDCT in patients with deep pelvic cecum versus conventional cecum. On the basis of previous research for the range (6–10 mm) of normal appendix on MDCT [22], we considered acute appendicitis when MDCT findings show appendiceal diameter over 6 mm with accompanying findings such as enhancing wall thickening and periappendiceal infiltration. If the appendiceal diameter is greater than 10 mm and/or there are aforesaid accompanying findings, we considered it as highly specific acute appendicitis. The causes of misdiagnosis were classified into two categories: nondetection and misinterpretation. Nondetection was defined as (1) no conclusion regarding the appendix on preoperative MDCT or (2) the appendicitis was described as a normal appendix on the preoperative MDCT report even though it demonstrated MDCT findings of specific acute appendicitis in consensus of two readers (G.S.H. and C.W.L.). A situation in which appendicitis was described as a normal appendix despite MDCT findings of acute appendicitis was defined as misinterpretation. All the images were interpreted using PACS.

## 2.4. Statistical analysis

The independent *t* test was used to compare the age of patients between deep pelvic cecum and conventional cecum group. The Pearson's chi-square test was used to compare other characteristics of patients between deep pelvic cecum and conventional cecum group. The appendiceal direction and position were compared between the deep pelvic and conventional cecum group using the Fisher's Exact Test. SPSS 19.0 for Windows (SPSS Inc., Chicago, IL, USA) was used for statistical comparisons. A two-tailed parameter with a significance threshold of  $P < .05$  was used.



**Fig. 1.** Diagnostic criteria for a deep pelvic cecum on contrast-enhanced MDCT. The blind pouch of the cecum (arrowheads) is located below the inferior margin of the right sacroiliac joint (transverse dotted line) and to the left of the medial margin of the right psoas muscle (vertical dotted line).

Download English Version:

<https://daneshyari.com/en/article/4221122>

Download Persian Version:

<https://daneshyari.com/article/4221122>

[Daneshyari.com](https://daneshyari.com)