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Clinical Imaging 37 (2013) 514–519

CLINICAL IMAGING

CT appearance of the pelvis after Cesarean delivery—what is considered normal?

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Received 7 July 2012; accepted 21 September 2012

Abstract

Objective: To describe the normal computed tomography (CT) appearance of the pelvis after uncomplicated Cesarean section (C-section). **Patients and methods:** Pelvic CT examinations of 31 patients after uncomplicated C-section were reviewed. **Results:** Higher postoperative day (POD) correlated well with decreases in the uterine long axis and endometrial width but did not correlate to scar width. Full thickness defect of the uterine wall was revealed in 48% of patients. Small volumes of intrauterine gas presented in half of patients at POD 1–26. Free pelvic fluid appeared in 74%. Pelvic collections were rare and small. **Conclusion:** There is wide variability in pelvic CT appearance following uncomplicated C-section.

Keywords: Cesarean section; Computerized tomography; Uterus

1. Introduction

Postpartum complications after Cesarean section (CS) include endometritis, pelvic hematoma or abscess, ovarian vein thrombosis, and more. The most common presenting symptom is fever, and in this case, computed tomography (CT) of the abdomen and pelvis is often required to determine or rule out a source of infection. In the early puerperal period, it is difficult to differentiate fresh postoperative changes from true pelvic abnormality.

Reviews of the literature elicit only two previous studies describing the normal appearance of the female pelvis after CS [1,2]. The paucity of publications on this subject is understandable since imaging evaluation of the pelvis is performed only in cases of suspected complications and is not indicated in patients with an uneventful clinical course.

Of the two previous publications, one described normal Magnetic Resonance Imaging (MRI) findings [2] and only one, by Twickler et al., described normal CT appearance of the pelvis after CS [1]. This paper, published in 1991, included a small series of patients examined with a single-slice CT machine, using thick slices with no multiplanar reconstruction (MPR). The normal multiplanar appearance of the pelvis after uncomplicated CS has not been described previously. Our objective is to describe the normal CT appearance of the female pelvis, focusing on the uterus, after uncomplicated CS. Knowledge of the spectrum of normal CT findings after CS is essential for correct diagnosis or ruling out pathology in cases where there is suspicion of postoperative complications.

2. Patients and methods

A search of our hospital registry identified 44 patients who underwent CT angiography of the pulmonary arteries due to clinical suspicion of pulmonary embolism (PE) during their hospitalization after CS between the years 2006 and

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http://dx.doi.org/10.1016/j.clinimag.2012.09.022

2010. The routine CT protocol during these years included a scan of the pelvis in pursuit of deep venous thrombosis as a probable cause for PE. We excluded 13 women who had fever and/or abdominal pain in addition to their respiratory complaints. A total of 31 patients with shortness of breath and no other clinical complaints or findings were included in our study group. The hospital records for patients were reviewed until hospital discharge to be certain that there were no late complications.

The hospital's institutional review board approved this study, and informed consent was waived.

Demographic details, indication for CS, postoperative day (POD), and clinical symptoms and signs as well as clinical course were derived from patients' files.

All CT scans were performed using a 16-slice scanner (LightSpeed, GE Healthcare, Milwaukee, WI, USA) after intravenous contrast was administered for angiography of the chest (120cc Iopamiro 300, Dexxon, UK) with an injection rate of 4 ml per second. Pelvic scans were performed in a craniocaudal direction from the level of the iliac crests to the subtrochanteric level of the upper hips with a delay of 120 s after the beginning of injection. The following parameters were used: 120 kVp, automated mA, 1.25-mm slice thickness reconstructed in 3.75-mm slices, 1.3 pitch, large field-of-view, and 512×512 matrix. Coronal and sagittal MPRs with 3-mm image thickness were created for all examinations on a dedicated workstation (Advantage Windows 4.1, GE Healthcare).

CT studies were retrospectively reviewed on our institutional picture archiving and communication system (PACS; Centricity PACS, GE Healthcare) using PACS software for digital measurements. All CT scans were reviewed blindly by two radiologists with 20 years of experience in pelvic imaging (N.H., N.S.) using a standardized review form. Cases of interobserver disagreement were resolved by consensus.

The maximal width of the endometrium was measured on the axial or coronal views, at the upper or middle segment of the uterus, according to the uterine cavity shape. The long axis of the uterus, width of the endometrial cavity, content of the uterus, and width of the scar within the uterine wall were examined. Discontinuity of the myometrium was defined when there was loss of clear margination of the myometrium with a full thickness gap in the opposition of the incision site. Each reviewer stated specifically whether or not wall discontinuity was seen at the incisional site. Other pelvic findings were documented, including volume and location of gas bubbles, free or loculated fluid, and hematoma. The location and volume of gas and fluid content inside and outside the uterus were graded subjectively by the readers as absent, small, or large.

The data was summarized using descriptive statistics. Correlation of scar width, uterine length, endometrial cavity width, and POD was performed using the Pearson's correlation test. Correlation of uterine discontinuity and POD was assessed using Spearman's test. Statistical significance was assumed at $\alpha<.05$. Statistical analysis was performed using Statistical Package for the Social Sciences for Windows 19.0 (IBM Software, Armonk, NY, USA).

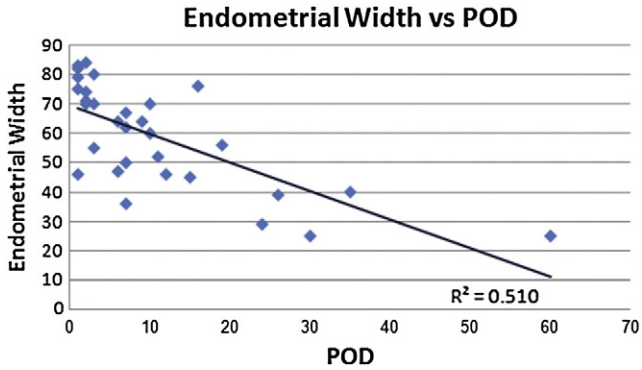

Fig. 2. A graph demonstrating the relationship between endometrial width (mm) and POD.

3. Results

A total of 31 women aged 21 to 43 years (mean, 31) were included in the study. All patients underwent CS with a low transverse uterine incision. Indications for CS included failure

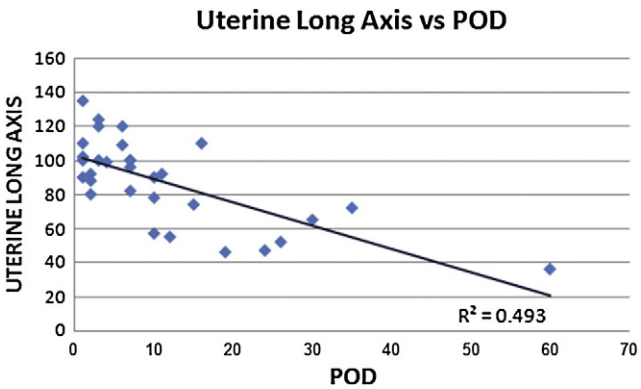

Fig. 1. A graph demonstrating the relationship between uterine long axis (in millimeters) and POD.

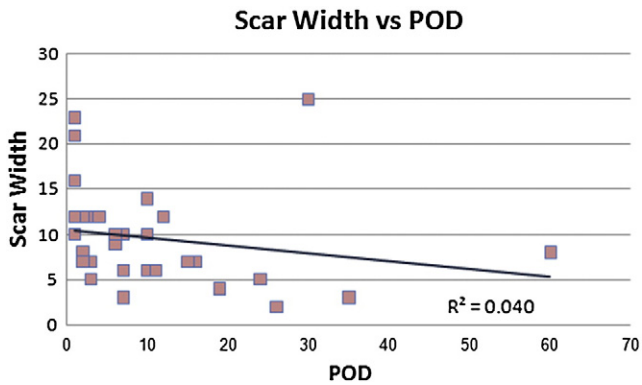

Fig. 3. A graph demonstrating the relationship between scar width (mm) and POD.