ER Journal Meeting

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100.09.14

Alvarado Score

Adult	Point
Migratory RLQ pain	1
Anorexia/ Ketouria	1
Nausea with vomiting	1
RLQ Tenderness	2
Rebound Tendmess	1
BT≧38℃	1
WBC＞10000	2
Left Shift(Neutrophil ＞75%)	1
Total Points	10

<5	Appendicitis less likely
5-6	Possible appendicitis
7-8	Probably appendicitis
>8	Very probably appendicitis

Child	Point
Anorexia	1
Nausea / Vomiting	1
Migratory RLQ pain	1
RLQ Tenderness	2
Cough/hopping/percussion pain in RLQ	2
Elevation of BT	1
WBC＞10000	1
Left shift of WBC	1
Total Points	10

≦2：rule out appendicitis
≧7：rule in appendicitis

Major Radiodiagnostic Imaging in Pregnancy and the Risk of Childhood Malignancy: A Population-Based Cohort Study in Ontario

Joel G.Ray, et al

Radiodiagnostic Imaging in Pregnancy: Sep. 2010 Volume 7

Editors' Summary - Background

- childhood cancer
  - ≦14 years old
  - a major cause of death
  - genetic predisposition：10%
  - most childhood cancer remains unknown
  - exposure to ionizing radiation in pregnancy？

Why Was This Study Done?

- CT and radionuclide imaging expose the fetus to considerably higher doses of radiation than plain radiographs.
- Many pregnant women could be exposed to major radiodiagnostic tests in emergency situations.
- 50% of pregnancies are unplanned and unawared.

  →determine the risk of cancer to those exposed

What Did the Researchers Do and Find?

- Retrospective population-based cohort study
- 1,835,517 maternal-child pairs in April 1, 1992 to March 31, 2008 in Ontario,Canada
- major radiodiagnostic test performed on the mother up to one day before her delivery date
- weighed ≧2,500 g, ≧ 37 wk gestation, survived for at least 30 days

  → The findings would remain applicable to most pregnancies

Risk of childhood malignancy in the offspring of women exposed to major radiodiagnostic testing in pregnancy compared to unexposed women.

Major Radiodiagnostic Test Exposure in Pregnancy			
Exposed (n=5,590) (3/1000)		Unexposed (n=1,829,927)	
n events (%)	Incidence rate per 10,000 person-years	n events (%)	Incidence rate per 10,000 person-years
4 (0.072)	1.13	2,539 (0.14)	1.56

- Prevalence：4/5590 = 0.07%

HR (95% CI)	
Crude	Adjusted[a]
0.69 (0.26–1.82)	0.68 (0.25–1.80)

- Hazard ratio
- Adjustments：maternal age, sex, income quintile, urban status, chromosomal or congenital anomalies in the infant

What Do These Findings Mean?

- The absolute risk appears to be low, while the relative risk is not materially higher than that of unexposed controls.
- The possibility that fetal exposure to CT or radionuclide imaging is carcinogenic cannot be excluded.(95%CI 0.25-1.8)
- Suggestion：
  - beta hCG testing
  - lead apron shielding
  - nonradiation-emitting imaging should be considered first (MRI and ultrasonography)
  - brief counseling

Take home messages

- 懷孕婦女接受CT or Radionuclide imaging而造成兒童罹癌的風險是存在的，MRI、US還是爲優先考量。
- 對於要接受高放射劑量檢查的婦女，都應給予Beta hCG檢查、衛教及防範措施。

MR Imaging Evaluation of Acute Appendicitis in Pregnancy

Ivan Pedrosa, et al.
Radiology: Volume 238: Number 3—March 2006

Background

- The anatomic and physiologic alterations associated with pregnancy.
- The differential diagnosis of right-sided pain in pregnancy is broad
  - ligamentous laxity
  - hemorrhagic corpus luteum cyst
  - renal colic
  - ovarian torsion
  - degenerating fibroid
- Difficulty in diagnosis of appendicitis may result in delayed treatment and complications from delayed diagnosis of appendicitis.

Background

- Limitations of Ultrasonograhy：
  - Graded compression US may not be feasible owing to the size of the enlarged gravid uterus, particularly in the 3rd trimester
  - normal appendix is visualized in 13%–50% of patients who are not pregnant
  - Negative predictive value of a nonvisualized appendix is, at best, 90%
- Computed tomography (CT) has high radiation dose.

Purpose

- To retrospectively assess the diagnostic performance of magnetic resonance (MR) imaging in pregnant patients suspected of having acute appendicitis.

Materials and Methods

~retrospective

- Patients
  - March 1999 and April 2004
  - 51 pregnant patients in Beth Israel Deaconess Medical Center
  - mean patient age was 28.3 years (age range, 15–37 years)
  - mean gestational age was 19.8 weeks (range,4–38 weeks)

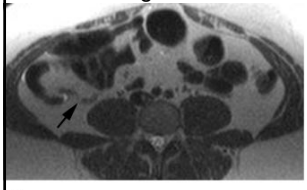
Materials and Methods

- Imaging Protocol
  - Patients received an oral contrast material
  - Half-Fourier single-shot fast spin-echo
  - T1-weighted, T2-weighted images
  - Time-of-flight T2*-weighted gradient-echo images
  - Transverse/coronal/sagittal planes

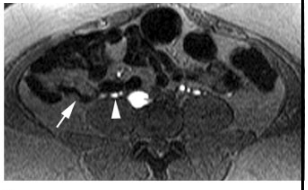
Materials and Methods

- Initial interpretations
  - Negative：＜6 mm in diameter and/or it was filled with oral contrast material, air, or both.
  - Positive： ＞7 mm in diameter
  - Inconclusive：6–7 mm in diameter (periappendiceal fat stranding, abscess were used to make the diagnosis)

- T2WI single-shot fast SE image
- T2*WI(Time-of-flight gradient-echo Image)



a.



b. ■Blooming effect

Materials and Methods

- Retrospective Review：
  - Three radiologists reviewed MRI after 3 months.
- 5-point scale：(by Time-of-flight images)
  - 1 not identified
  - 2 less than half identified
  - 3 approximately half identified
  - 4 more than half identified
  - 5 well visualized in its entirety.
- Periappendiceal fat stranding, phlegmon, abscess, oral contrast material in the cecum
- Additional findings

Materials and Methods

- Statistical analysis ：
  - Initial interpretations for accuracy
  - median and Fisher exact tests
  - Spearman correlation coefficient

Results

~Under MRI~

- Negative：44
- Positive：4 (under US：2)
- Inconclusive：3 (considered false-positive)
- Sensitivity： 100%
- Prevalence：22/23290
- Specificity：93.6%
- prevalence-adjusted
  - positive predictive values：1.4%
  - negative predictive values：100%
- Accuracy：94% (48/51)

- Inconclusive(7 mm)

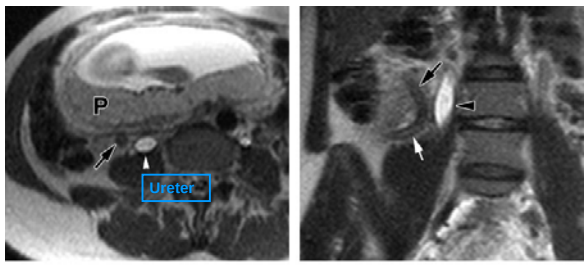


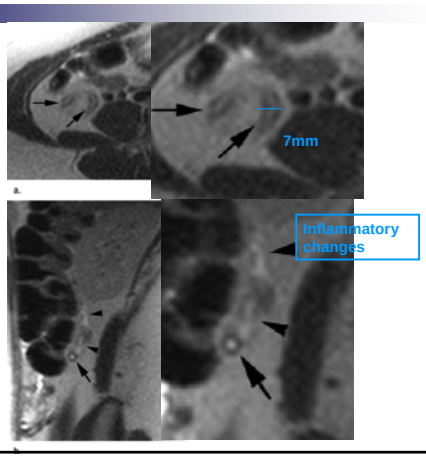
Table 1

Summary of Findings in the Four Patients with Appendicitis

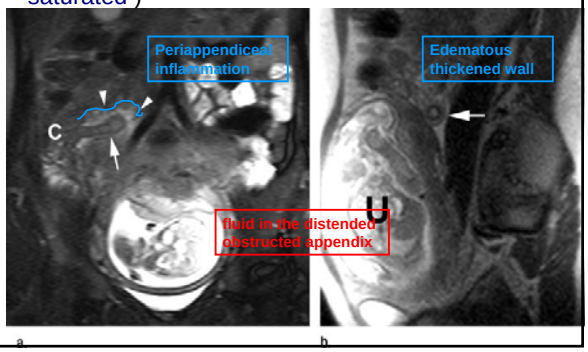
Patient No.	Gestational Age (wk)	Imaging Appearance: US	Imaging Appearance: MR Imaging	Clinical Course
1	13	Normal, normal appendix was not visualized	Appendix was 7 mm in diameter with periappendiceal edema	Acute appendicitis was diagnosed at surgery and pathologic examination
2	20	Noncompressible tubular structure without a definitive blind ending, findings suspicious for appendicitis	Appendix was 17 mm in diameter with periappendiceal edema	Acute appendicitis was diagnosed at surgery and pathologic examination
3	27	Noncompressible tubular structure in right lower quadrant with surrounding phlegmon, likely due to appendicitis	Appendix was 13 mm in diameter with phlegmon*	Patient was treated with antibiotics but had a second episode of acute pain 32 weeks later, at which time MR imaging showed a 9-mm fluid-filled appendix with decreased phlegmone, a perforated appendicitis was found at surgery
4	31	Normal, normal appendix was not visualized	The body of the appendix was 7 mm in diameter, enlarging to 10 mm at the tip with periappendiceal edema	CT performed the same day helped confirm findings; the patient's symptoms improved after antibiotic therapy

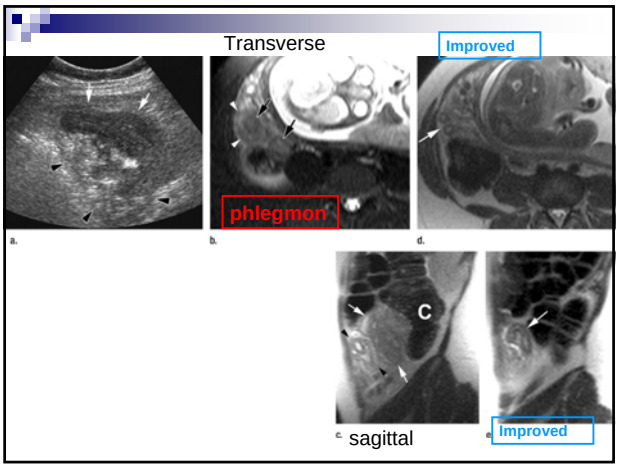
* In this case, MR imaging was performed to confirm that the phlegmon was from the appendix and to determine the size of the phlegmon because the surgeons believed that if the appendix had already perforated, and if a large phlegmon was present, it would be best treated initially with antibiotics.

- T2WI



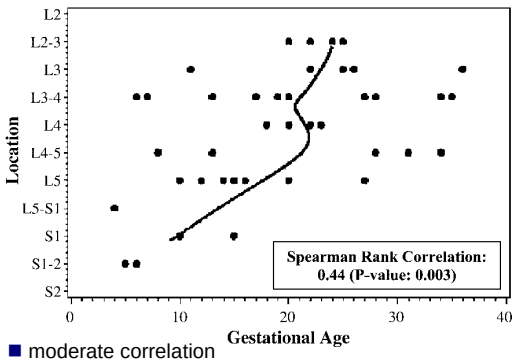
- Coronal single-shot fast SE image(fat-saturated)
- Sagittal single-shot fast SE image





Retrospective Review

- Visualization of the appendix was achieved more often in patients with contrast material in the cecum than in those without.(P=0.67)
- There was a trend toward better visualization of the appendix with an earlier gestational age.(P=0.1)
- Of the 47 patients without acute appendicitis, MR imaging showed a normal appendix in 39 (83%)
- Appendix was well visualized in its entirety (5point) in 29 patients.



- moderate correlation

Table 2

Ancillary Findings at MR Imaging

Diagnosis	No. of Patients	Gestational Age (wk)
Enlarged right gonadal vein	11*	28.3 ± 7.8†
Right hydronephrosis		
Mild	12	24.8 ± 5.6†
Moderate	10	21.8 ± 6.9†
Severe	3	30 ± 5.6†
Degenerated fibroids	6	18.3 ± 4.6†
Ovarian torsion	1	27
Ectopic pregnancy	1	6
Urinary tract infection with gas in the urinary bladder	1	31
Subchorionic hemorrhage	11	17.2 ± 8†
Ruptured corpus luteum cyst‡	2	6 ± 1.4†

* Four patients had no hydronephrosis. Hydronephrosis was mild in four patients, moderate in two, and severe in one.

† Data are means ± standard deviations.

‡ A ruptured corpus luteum cyst was diagnosed on the basis of findings of a hemorrhagic cyst, fluid in the pelvis, and clinical presentation.

Discussion

- Negative predictive value of 100%
  →exclude appendicitis in pregnant patients
- Safety(no known deleterious effects)
- High rate of visualization
  - blooming effect caused by air and/or oral contrast
  - T2*-weighted time-of-flight images can help identify small blood vessels
  - T2-weighted images shows obstructed fluid-filled appendix

Limitation

- not all pregnant patients with abdominopelvic pain underwent imaging
- Radiologist who covered the service attending the initial interpretations.
- The number of patients with acute appendicitis in our series is small.
- There was no pathologic confirmation in one of the cases.
- The change in interpretation of inconclusive studies made a false-positive result.

Conclusion

- MR imaging is an excellent modality for excluding acute appendicitis in pregnant women.
- MR imaging eliminates unnecessary radiation from CT.
- MR imaging offer an alternative diagnosis in pregnant women with right-sided abdominal pain
- More studies with larger series of patients are needed to establish.

Take home messages

- MRI 提供了準確、非侵入性且無放射劑量問題的檢查。
- 對於懷疑有Acute appendicitis的懷孕婦女，使其接受MRI檢查，來排除其罹病可能性，可減少沒必要的手術。
- 知道如何利用blooming effect、periappendiceal fat stranding、phlegmon來判讀Acute appendicitis在MRI上的表現。