

3-1987

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### Recommended Citation

Lee, Chang Y.; Madrazo, Beatrice L.; Parks, Sheryl; and Sandler, Michael (1987) "Ultrasonic Evaluation in the Management of Postpartum Infection," *Henry Ford Hospital Medical Journal* : Vol. 35 : No. 1 , 58-62. Available at: <https://scholarlycommons.henryford.com/hfhmedjournal/vol35/iss1/12>

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## Ultrasonic Evaluation in the Management of Postpartum Infection

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*To evaluate the effectiveness of ultrasound in the management of postpartum problems, ultrasonographic examination was performed on 98 patients with suspected postpartum infection. The study includes only those patients who did not respond to antibiotic treatment for at least 48 hours and those patients who were readmitted to the hospital with suspected postpartum infection. Echogenic tissue was found in the uterine cavity in 12 patients, and significant fluid collection was found in 24 patients. Gas collection appeared in the uterine cavity in five patients and around the uterine incision in four patients. Fluid collection was found around the uterine incision in five patients, and abscess formation under the abdominal incision was found in 11 patients. Although ultrasound was nondiagnostic in 31 of the 98 patients, information obtained by ultrasound could be used to reduce the duration of the infectious morbidity. (Henry Ford Hosp Med J 1987;35:58-62)*

During the past decade the frequency of postpartum infection has increased along with the cesarean section rate. Although new antibiotics to treat postpartum infection are constantly being marketed, postpartum infection remains a serious threat to the obstetric patient. While the incidence of postpartum infection after vaginal delivery ranges from 2% to 3%, the incidence after cesarean delivery has been reported as high as 29% to 85% (1,2). In an effort to reduce the incidence of postpartum infection, major attention has focused on identifying risk factors as well as administering prophylactic antibiotics in selected cases.

Ultrasound is an indispensable diagnostic tool in the obstetric practice. Although this technique has been used primarily in the management of antepartum problems, its application has been extended to treat postpartum problems (3-5). In a previous study we determined the clinical usefulness of ultrasound in the management of postpartum bleeding (5). We also noted in the study that retained placental tissue and large blood clots were not only the cause of postpartum bleeding but also a frequent cause of postpartum infection. These findings led us to investigate further the use of ultrasound in the management of postpartum infection.

The purpose of the present study was to 1) obtain ultrasonographic characteristics of postpartum infection, and 2) evaluate the influence of ultrasonographic information in the clinical management of these cases.

### Materials and Methods

In our previous study, to establish normal parameters for the ultrasonic findings of the postpartum uterus, we obtained ultra-

sonic scans from 25 patients who had no complications on the first and second postpartum days (5). To obtain normal ultrasonic information on the uterine and abdominal incisional areas, ultrasonic scans were taken on the second and third postpartum days from four patients who had low-segment cesarean sections. In the longitudinal scans (Fig 1), the repaired uterine incision appeared as a narrow, thickened band containing images of double-layered sutures. No evidence of fluid or gas collection appeared in the uterine cavity or around the uterine incision. In one patient, however, a small amount of fluid had collected under the abdominal incision. These normal ultrasonic findings of the postpartum uterus and abdominal incision were used to compare with those findings in the present study.

From February 1, 1979, to January 31, 1982, 98 patients with suspected postpartum infection were referred to the Division of Diagnostic Ultrasound at Henry Ford Hospital for ultrasonic evaluation. Ninety-four patients delivered their infants at Henry Ford Hospital, and four patients were admitted through the Division of Emergency Medicine after delivering their infants at outlying hospitals. Twenty-two patients had vaginal deliveries, and 76 patients had cesarean section performed.

Patients with suspected urinary and upper respiratory infections were excluded from the study. Antibiotics were started for

Submitted for publication: December 2, 1986.

Accepted for publication: January 15, 1987.

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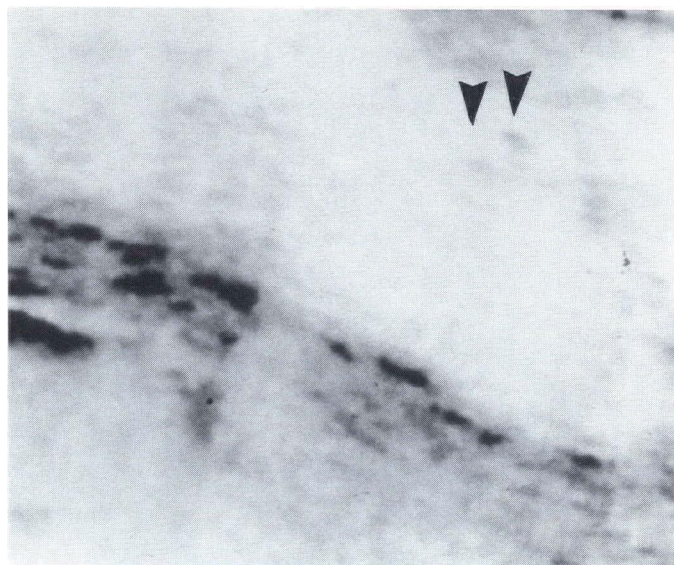


Fig 1—Repaired uterine incision appeared as a narrow, thickened band containing images of double-layered sutures (arrows) in a longitudinal scan.

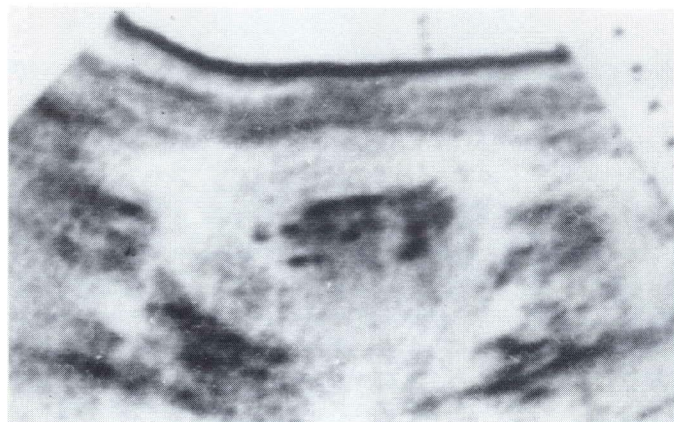


Fig 2—Formation of multiple gas pockets in retained blood clots (tenth postpartum day).

postpartum infection if the patient a) developed a fever of 38.6°C or greater within 24 hours after delivery or b) developed a fever of 38.2°C or greater more than two times in the 24 hours thereafter. We included in the study only those patients who had not responded to antibiotic treatment within 48 hours and those who were readmitted with suspected endomyometritis and wound infection.

Ultrasonic scans were performed with commercially available grey-scale units. When the patient's bladder was moderately filled with urine, the pelvic structures and/or abdominal incisional area were evaluated with a series of longitudinal and transverse scans. The ultrasonic findings were relayed to the obstetrician. Use of ultrasonic information in the clinical management of these patients was at the discretion of the individual obstetrician.

**Table**  
**Sonographic Findings in Patients with Suspected Postpartum Infection**

Sonographic Findings	Number of Patients
Dilated uterine cavity with echogenic tissue	10
Dilated uterine cavity with echogenic tissue and gas	2
Dilated uterine cavity with fluid	22
Dilated uterine cavity with fluid and gas	2
Gas within the uterine cavity	5 *
Fluid collection around uterine incision	5
Gas within or around uterine incision	4 †
Hematoma in broad ligament	2
Hematoma or abscess formation in abdominal incision	11
Normal uterine cavity with fluid in cul-de-sac	3
Possible ovarian vein thrombophlebitis	1
No abnormal findings	31
Total	98

\*Two patients were found to have abscess formation in the abdominal wall.

†Three patients were found to have gas formation in the uterine cavity.

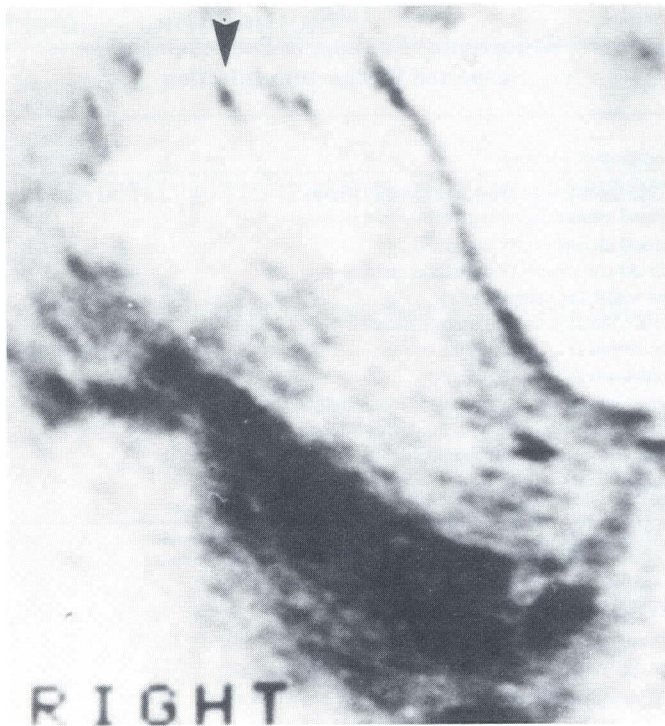
## Results

### Ultrasonic findings

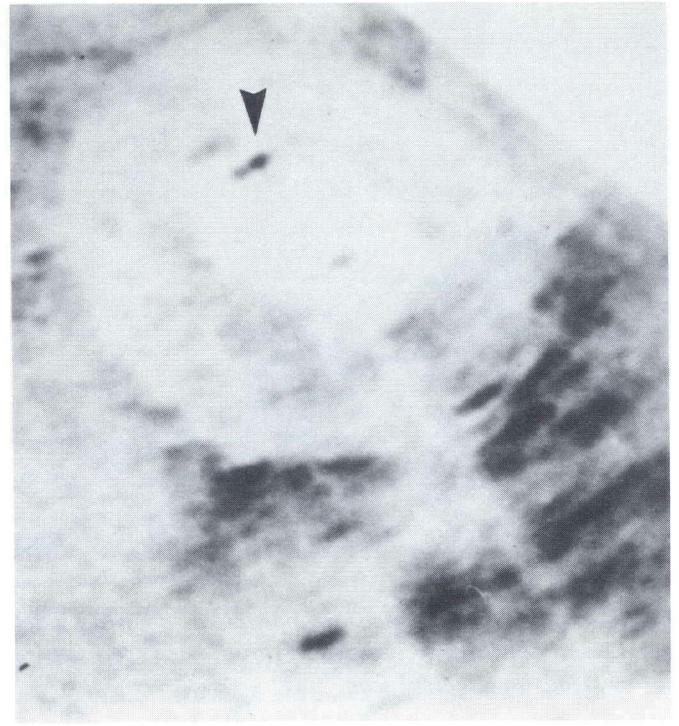
Ultrasonic findings of the patients with suspected postpartum infection are summarized in the Table. A significant amount of echogenic tissue was found in the uterine cavity of 12 patients. Gas pockets appeared in the retained tissue as multiple strong echoes with attenuation of sound beams in two patients (Fig 2). A significant amount of fluid had collected in the uterine cavity of 24 patients; in two of these patients, gas formation appeared as a strong echo above the fluid collection [Fig 3 (A) and (B)]. In five patients, gas formation appeared in the uterine cavity as multiple strong echoes with attenuation of sound beams [Fig 4 (A) and (B)]. In two of those five patients, a significant collection of fluid also appeared under the abdominal incision. Gas formation appeared within or around the uterine incision in four patients. In three of these patients, multiple gas formation also appeared within the uterine cavity (Fig 5). A significant collection of fluid appeared around the uterine incision in the ultrasonic scan of five patients [Fig 6 (A)]. Hematomas in the broad ligaments were found in two patients, and significant amounts of fluid collection in the cul-de-sac were found in three patients. In 11 patients, hematoma or abscess formation appeared under the abdominal incision. In one patient, possible ovarian vein thrombophlebitis was suggested by ultrasonic findings of moderate-to-severe hydronephrosis and hydroureter above the pelvic brim on the right side. No abnormal findings could be identified on the ultrasonic scans of 31 patients.

### Clinical findings

Ultrasonic findings of retained tissue were relayed immediately to the obstetrician. Use of this information in the clinical management of the patient was at the discretion of the individual physician; however, suction curettage was performed for all 12 patients who were found to have retained tissue by ultrasonic scan. Retained placental tissue was found in five patients, and 40 to 80 mL of blood clots and necrotic decidua were removed from seven patients. All 12 patients responded to antibiotic treatment

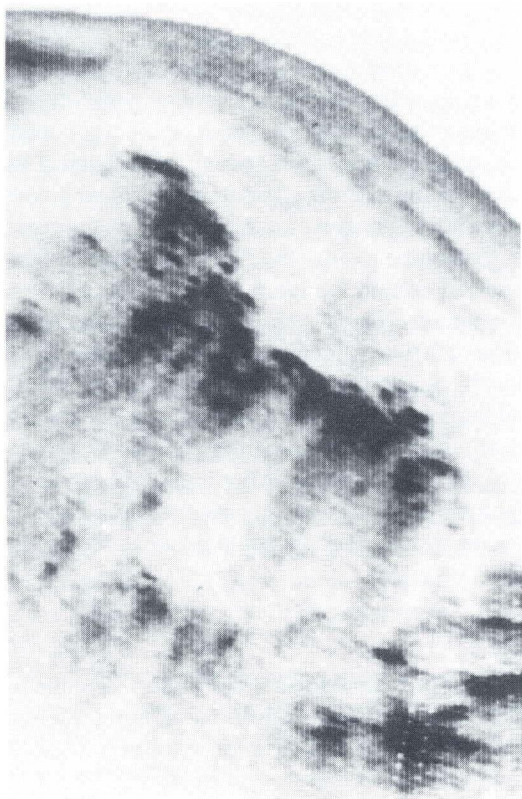


(A)

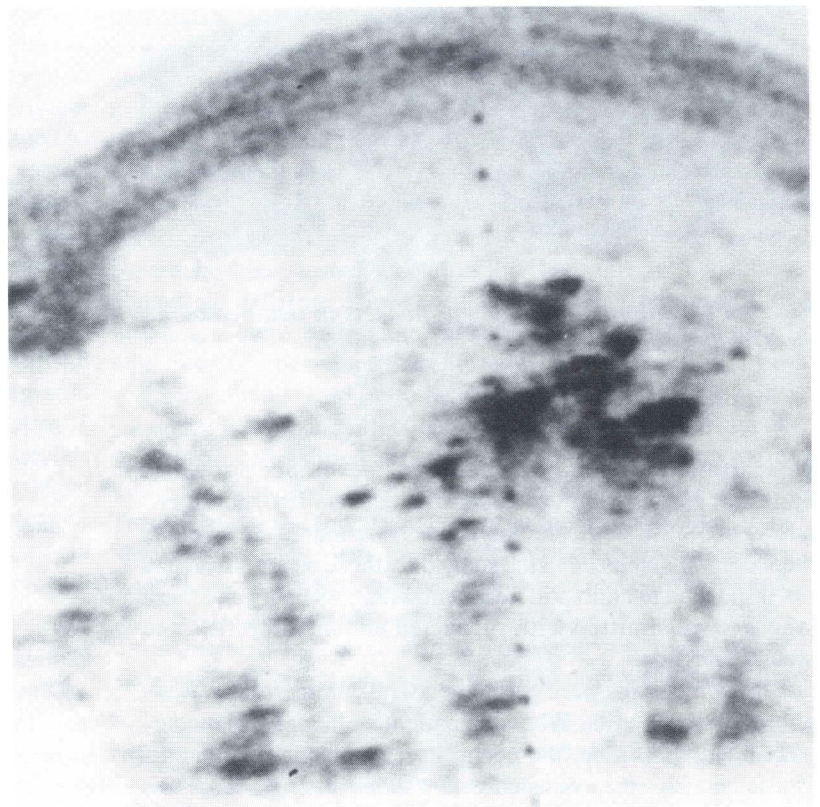


(B)

Fig 3—Collection of fluid in endometrial cavity. Gas formation appeared as a strong echo (arrow). (A) Longitudinal scan. (B) Transverse scan.



(A)



(B)

Fig 4—Extensive gas formation in uterine cavity appeared as strong echoes with attenuation of sound beams. (A) Longitudinal scan. (B) Transverse scan.



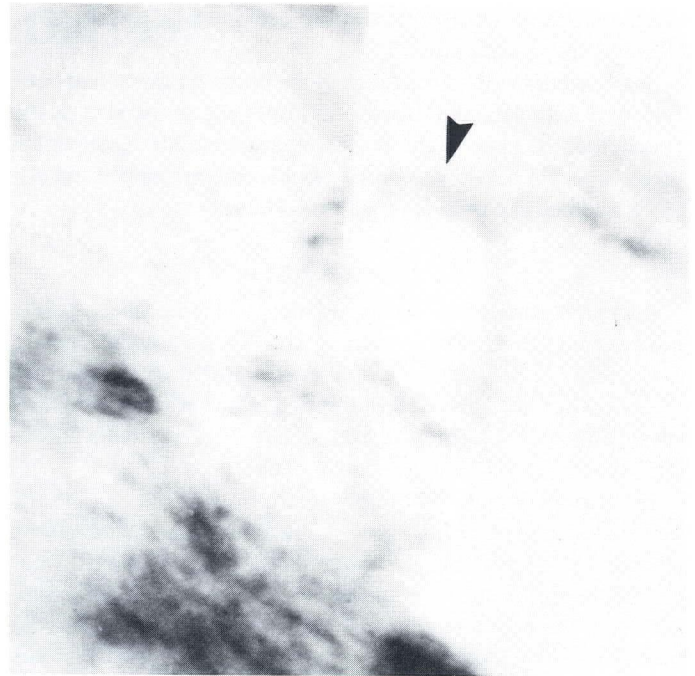
*Fig 5—Gas formation around the uterine incision. Gas formation also appeared in the endometrial cavity. Small amount of fluid also appeared around the uterine incision.*

in 24 to 48 hours after the evacuation procedure. Seven of these 12 patients were readmitted five to 12 days after delivery with fevers of 38.6°C to 39.6°C and varying degrees of vaginal bleeding. Three of these seven patients had been treated with antibiotics before they were discharged.

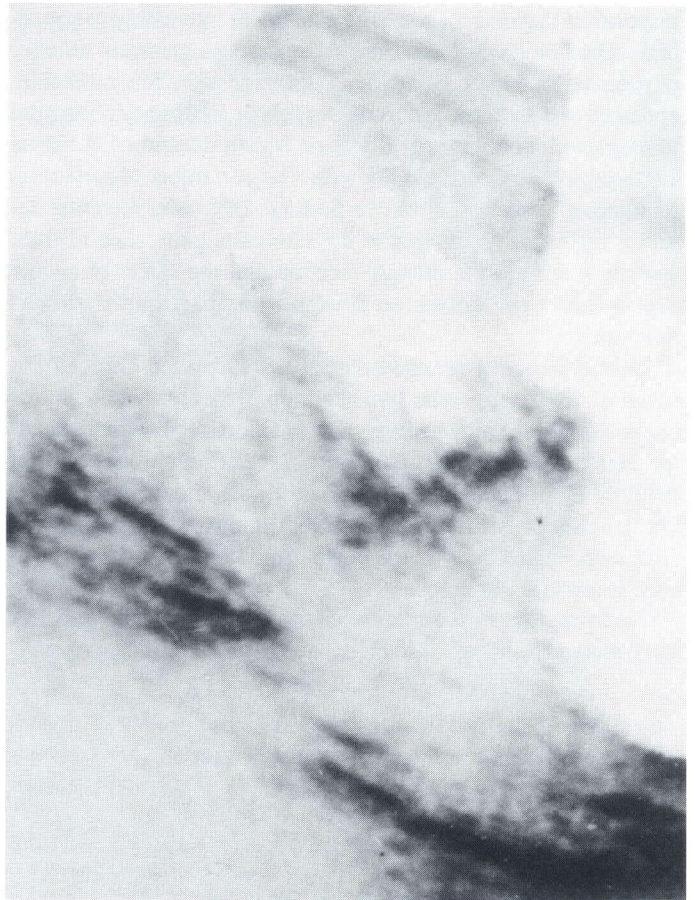
The uterine cavity was dilated with fluid collection in 24 patients. In seven patients, the lochia was drained by introducing ring forceps into the uterine cavity; six patients in this group became afebrile within 24 hours after drainage of lochia. Seventeen patients without artificial lochial drainage responded to antibiotic treatment one to four days after ultrasonic examination. Two of the 17 patients had ultrasonic evaluation repeated after therapeutic response revealed spontaneous drainage of collected lochia. Five patients had a significant collection of fluid around the uterine incision [Fig 6(A)]. Guided by ultrasound, serosanguineous fluid was successfully aspirated with an 18-gauge needle in two patients [Fig 6(B)]. After aspiration, both patients responded to antibiotic treatment within 24 hours.

Ultrasound showed a hematoma or abscess under the abdominal incision in 11 patients. A modified Pfannenstiel incision was performed in ten of these patients. The infected fluid or hematoma was evacuated in six patients, all of whom responded quickly to antibiotics.

In three patients, gas formation was of a significant degree to suspect infection with *Clostridium* species. However, in only



*Fig 6(A)—Collection of fluid around uterine incision (arrow).*



*Fig 6(B)—Ultrasonogram taken after aspiration of fluid guided by ultrasound.*

one patient did a culture from the endometrial cavity grow *Clostridium perfringens*.

Two patients with hematomas in the broad ligament had been followed with repeated ultrasound to evaluate the size of the hematoma, the kidney, and ureter on the same side. One patient with suspected pelvic vein thrombophlebitis responded to antibiotic and heparin treatment within 24 hours.

### Discussion

Although ultrasound has been widely used to evaluate pelvic inflammatory disease in gynecology (6-10), a study designed to evaluate its clinical value in the management of postpartum infection has not appeared in the English literature, which is surprising, considering the prevalence of postpartum infection, especially following cesarean delivery (1).

In the present study, nondiagnostic findings in 31 patients demonstrated severe limitation of ultrasound in the management of postpartum infection. However, our purpose was not to evaluate the diagnostic ability of ultrasound for postpartum infection, but rather to 1) obtain additional information from patients who had not responded to antibiotic treatment within at least 48 hours or from patients who were readmitted with possible postpartum infection, and 2) evaluate the influence of this ultrasonic information on the clinical management of these cases.

Lochial block has been long suspected as a cause of postpartum endometritis because it provides a culture medium for the responsible organisms. Nonetheless, it was interesting to see actual lochial block on the ultrasonic scan in a significant number of patients. In our study, artificial drainage of lochial collection appeared to decrease the duration of febrile morbidity compared to cases with spontaneous drainage (mean duration 1.4 versus 1.9 days). A prospective study with a large number of patients is required to further confirm this finding. One other area that deserves further investigation is the clinical significance of fluid collection around the uterine incision and the effect of needle aspiration of the collected fluid on postpartum infectious morbidity.

The diagnosis of retained tissue was suspected clinically in seven of 12 patients who had retained placental tissue and/or blood clots, since they had a significant amount of vaginal bleeding along with temperature elevation. Suction curettage is not required in all patients with retained tissue and/or blood clots. We have successfully evacuated retained tissue and/or blood clots with ring forceps on the postpartum floor after the preliminary study in some cases.

Gas formation in the uterine cavity and around the incision was observed in 13 cases. In three cases it was significant enough

to suspect infection with *Clostridium* species. However, in only one case did the culture grow *Clostridium perfringens* [Fig 4 (A) and (B)]. In addition to the *Clostridium* species, *Escherichia coli*, *Bacteroides*, and *Enterobacteriaceae* species are also capable of forming gas (11).

A large hematoma was found in the broad ligament on ultrasonic scans in two cases. These patients had repeated ultrasound to evaluate the resolution of the hematoma and the degree of hydronephrosis on the same side. The diagnosis of possible right ovarian vein thrombophlebitis was based on the moderate-to-severe hydronephrosis and hydroureter above the pelvic brim in one case. However, computed tomography has been used more effectively to make a confirmatory diagnosis of this disease (12,13).

Although nondiagnostic ultrasonic findings in 31 of the 98 patients demonstrated severe limitation of ultrasound in the management of postpartum infection, certain information obtained by ultrasound may be useful in reducing the duration of infectious morbidity. Further studies are required.

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