

## Sonography of pleural space in healthy pregnant - preliminary results

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**Background.** The purpose of our study was to determine the incidence of sonographically visible normal pleural fluid finding in healthy pregnant.

**Methods.** Chest sonography was performed in 47 pregnant volunteers, searching for pleural fluid, first leaning on the elbow and than in a sitting position. 9-12 MHz linear probe was used. If the result of the first examination was positive (at least 2 mm thick anechoic layer), we repeated the procedure with 3-6 MHz large radius convex probe.

**Results.** The fluid layer of typical wedge-shaped appearance was visible in the pleural space of 28/47 (59.5%) pregnant volunteers, on both sides in 18/47 (38.3%) and unilaterally in 10/47 (21.2%). The mean thickness of fluid layer (mean of positive results in both positions) was 2.86 mm (SD 1.09 mm, range from 1.8 mm to 6.4 mm). More than 3 mm thick fluid layer was easily detected with 3-6 MHz abdominal convex probe in 7/47 (15%).

**Conclusions.** Small amounts of pleural fluid can sometimes be detected by chest sonography, and hence also by abdominal sonography, in otherwise healthy pregnant. Such a positive result, if isolated, should not be taken as a sign of occult thoracic disease.

Key words: pleura-ultrasonography; pregnancy

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### Introduction

A small amount of fluid (5-15 ml) is often present in the pleural space of healthy individuals.<sup>1</sup> No data could be found in the liter-

ature on imaging of normal pleural fluid in healthy individuals. Only an older textbook by Felson<sup>2</sup> reports that »in some normal individuals a small amount of free fluid, as little as 5 to 10 cc, can be demonstrated and even aspirated«, basing the claim on 50 to 70 year old references. He continues that »the incidence is higher during pregnancy« without providing a reference.

Data on the smallest amount of pleural fluid detectable by imaging methods vary considerably, but they are essentially within the same broad range whether computed tomography, sonography or X-ray examination are

Received 28 November 2004

Accepted 15 December 2004

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used.<sup>3-8</sup> Cadaveric studies<sup>9</sup> have shown that volumes of pleural fluid as little as 5 ml may be detected with chest radiographs taken in lateral decubitus position. Recent reports have proved that minute pleural effusions can be easily detected using chest ultrasonography.<sup>4,10</sup> The latest study, comparing chest sonography with expiratory lateral decubitus radiography in the diagnosis of very small pleural effusions, showed that sonography appears to assess the fluid layer more accurately than radiography.<sup>11</sup>

We undertook this study to determine the possibility of sonographic detection of normal pleural fluid in healthy pregnant and to assess the frequency of this finding.

### Patients and methods

Chest sonography was performed in 47 healthy pregnant volunteers, searching for pleural fluid. They had no signs of respiratory infections and normal results of laboratory tests. They were found healthy throughout regularly check-ups with their obstetrician. They all delivered healthy babies on term.

The sonographic criterion for the presence of pleural fluid was detection of an anechoic zone between the parietal and visceral pleura, at least 2 mm thick (in the elbow position), changing appearance between inspiration and expiration and/or changing appearance with different positions during examination.<sup>4,6,12</sup>

The subject was placed in the lateral decubitus position for 5 minutes; sonography of the lower pleural space was performed with the subject leaning on her elbow<sup>11</sup> and then in a sitting position. An SSA-390 ultrasound scanner (Toshiba, Tokyo, Japan) was used, initially with a 9-12 MHz linear, 5.7 cm long transducer. If pleural fluid was observed, we repeated the examination of the pleural space with 3-6 MHz large convex transducer, commonly used during abdominal examinations. Maximal fluid layer thickness was measured, with the position of the probe perpendicular to the thoracic wall.<sup>13</sup>

Descriptive statistics were calculated for all the studied parameters. Mean differences were tested using t-test (for independent or paired samples, as appropriate), correlation was assessed using Pearson's correlation co-



**Figure 1.** Wedge shaped echofree fluid layer measuring 3 mm (between arrows) represents normal pleural fluid accumulation; L=liver.

efficient and Fisher's exact test was used for analyzing contingency tables.

The study was approved by the Medical Ethics Committee of the Republic of Slovenia, and written informed consent was obtained from each subject prior to inclusion in the study.

## Results

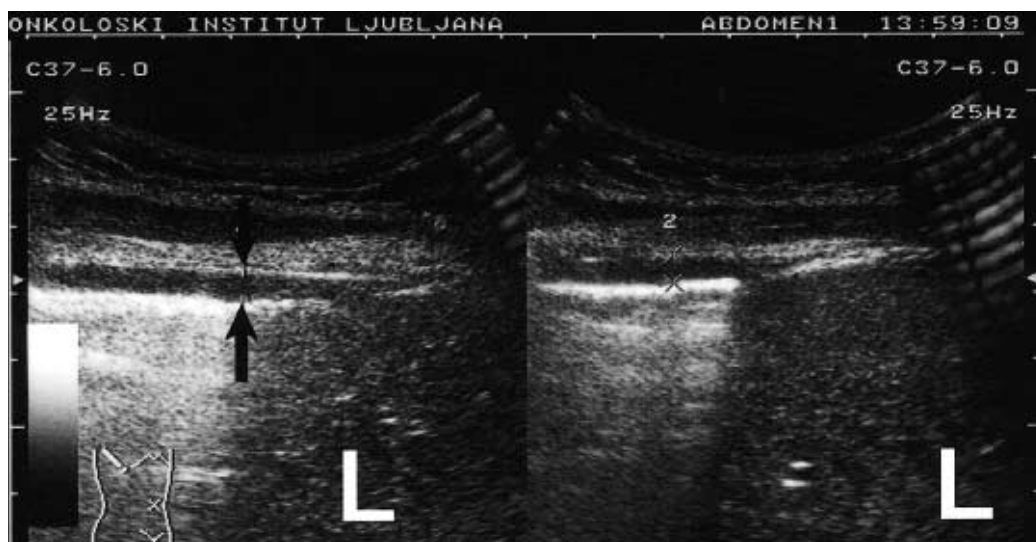
We examined 47 healthy pregnant volunteers with mean gestational age of 24.4 weeks (SD 4.6 weeks, range from 16 to 32 weeks) and we sonographically detected anechoic fluid layer in the pleural space in 28 subjects (59.5%). Fluid was observed bilaterally in 18 subjects (38.3%) and unilaterally in 10 subjects (21.2%), 9 of those on the left-hand side.

The mean fluid layer thickness was 2.95 mm (SD 0.99, range from 2.0 mm to 6.0 mm) in patients leaning on the elbow. In sitting position the mean thickness was 2.66 mm (SD 0.97, range from 1.8 mm to 6.4 mm). The difference between the two positions proved to be statistically significant (t-test:  $p=0.001$ ). Fluid layer detected with the linear probe was

clearly visible with the large radius convex probe if it measured 3 mm or more, which was the case in 7 subjects (15% of all subjects, 25% of subjects with visible fluid layer).

In the total sample, there were 24 male and 23 female fetuses. Among the pregnant with visible pleural fluid there was also an equal number (14) of male and female fetuses. Fluid layer thickness (mean of positive results in both positions) in pregnant carrying male fetuses was 3.18 mm (SD 1.12, range from 2.0 mm to 6.4 mm) while in pregnant carrying female fetuses the mean fluid layer was 2.44 mm (SD 0.58, range from 1.8 mm to 4.5 mm). The difference in mean fluid layer thickness proved to be statistically significant (t-test:  $p=0.041$ ). Association between fetus gender and mean fluid layer thickness equal to or above 3 mm was marginally significant (Fisher exact test:  $p=0.077$ ) in our sample, whereby 6 out of 7 mothers with visible fluid layer at least 3 mm thick carried male fetuses.

We found no correlation between age of pregnant woman and mean fluid layer thickness ( $r=0.044$ ;  $p=0.823$ ), no correlation between gestation age of the fetus and mean fluid layer thickness ( $r=-0.189$ ;  $p=0.335$ ), as well



**Figure 2.** Detection of pleural fluid using 6 MHz abdominal large radius convex probe (between arrows); L=liver.

as no difference in mean fluid layer thickness between left and right pleural space (t-test:  $p=0.451$ ).

### Discussion

Parietal and visceral pleura and the space in-between usually measure only 0.3 to 0.4 mm.<sup>10</sup> On sonograms, normal pleural fluid accumulation typically appears as a wedge-shaped echofree layer with the base oriented towards frenicocostal sulcus (Figure 1). Since our examination revealed pleural fluid in both elbow and sitting position in almost 60% of subjects, we believe that there is a possibility to observe pleural fluid during routine sonographic examination of abdominal organs in perfectly healthy pregnant women. Fluid layer at least 3 mm thick was easily detectable with large convex 3-6 MHz probe (Figure 2) in 25% of the pregnant with visible pleural fluid. If one misinterprets this as a pathologic condition (sign of occult thoracic disease), it can lead to unnecessary diagnostic examinations, such as X-ray, potentially harmful to the fetus.

In our group of 16 - 32 weeks pregnancies results showed no association between gestation age of the fetus and mean fluid layer thickness. However the value of this finding is limited as the sample was relatively small and early/late pregnancies were not examined. As expected, we found a statistically significant difference in mean fluid layer thickness regarding the subject's position during examination (on the elbow vs. sitting). Unexpectedly, we found male fetuses corresponding to thicker fluid layer on average.

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