The Location of Needle Insertion Effect on Maternal Pain in Amniocentesis

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Objective: *The purpose of this study was to determine whether maternal pain in amniocentesis was associated with the location of needle insertion and other identifiable clinical correlates.*
Material and Method: *This prospective study of mid-trimester amniocentesis was conducted between October 2005 and December 2005. Women were asked to complete a visual analog scale (VAS) after the amniocentesis. The distance from uterine fundus to symphysis pubis and from the location of needle insertion to symphysis pubis were measured and calculated to divide the insertion into two groups: upper third and middle third. The effect of previous amniocentesis, previous abdominal surgery, needle insertion through placenta and operators' experience was determined. The t-test was used for analysis; a probability value of < 0.05 was considered significant.*
Results: *Seventy-two women were participated in the study. The mean VAS was 2.7 ± 2.1. The perception of pain was significantly less in patients with the upper-third insertion as compared with the middle third insertion (VAS 2.2 vs 3.9, $p = 0.002$). Previous amniocentesis, previous abdominal surgery, needle insertion through placenta and operators' experience had no impact on pain intensity.*
Conclusion: *The pain from amniocentesis was significantly less in the patients with the needle insertion in the upper third of the uterus.*

Keywords: *Pain, Amniocentesis*

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Amniocentesis in the second trimester is the commonly performed invasive procedure for prenatal diagnosis of genetic disorders with high accuracy. Serious complications of amniocentesis are infrequent, including vaginal spotting or amniotic fluid leakage in 1% to 2% of patients. Risk of intra-amniotic infection is less than 1 per 1000, and fetal loss rate is less than 0.5%[1].

Although serious complications of second trimester amniocentesis are uncommon, most patients find amniocentesis to be somewhat painful and stressful. However, there are little reported data on the sensory or affective dimensions of pain that is associated with amniocentesis. The degree of pain and the various factors that modulate it have not been adequately established, especially the association between the location of needle insertion and maternal pain[2-6].

The objectives of this study were to determine whether sensory or affective dimensions of pain associated with second trimester amniocentesis, as measured by a validated pain scale, are associated with the location of needle insertion and any identifiable clinical correlates.

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Material and Method

All patients with singleton pregnancy, who were enrolled in the study, had been referred for genetic counseling in the second trimester of pregnancy and had consented to have amniocentesis performed at the Division of Maternal Fetal Medicine, King Chulalongkorn Memorial Hospital, Bangkok, Thailand between 1 October and 31 December 2005. The patients

with diabetes, psychiatric disorders or amniocentesis immediately after sonographic detection of a severe congenital anomaly were excluded. The Ethical Committee at our institution approved the study. Written informed consent was obtained from all participants. Participants were interviewed following the question in the case record form before amniocentesis that assessed maternal age, parity, weight, history of previous amniocentesis and previous abdominal surgery. All amniocenteses were performed by fellows or staffs of the Division of Maternal Fetal Medicine with continuous ultrasound guidance with the use of a 21-gauge spinal needle (1). No local anaesthetic was used for the procedures. The location of needle insertion was selected by fellows or staff who performed the procedure to avoid puncturing through placenta without causing fetal trauma. If placental puncture was inevitable, the location with minimal placental thickness was chosen. Approximately 18 mL of amniotic fluid was obtained. Fetal cardiac activity was observed before and after the procedure (1).

Immediately after the procedure, the visual analog scale (VAS) was used to subjectively quantify the patient's perceived pain. The patients were asked to indicate a point along a 10-cm horizontal continuous line from 0 to 10 (no pain to excruciating pain). The distance, measured in cm to the nearest 0.1 cm, of the marked point from the 0 edge provided the VAS score. The distance from uterine fundus to symphysis pubis and the distance from the location of needle insertion to symphysis pubis were measured using the cord tape. After the calculation, the location of needle insertion was divided into three areas according to the length of the uterus: upper third, middle third and lower third. The data collection was performed from the patients with upper third and middle third insertion. The lower third insertion was avoided because of the risk of bladder injury and contamination from pubic hair.

In addition, the performing physician provided data regarding the ultrasound findings, colour of amniotic fluid, number of attempts to obtain amniotic fluid and complications. Neither the patient nor the physician was aware of each other's perception regarding the procedures.

Sample size calculation was based on the data from the study of Harris et al[2]. Statistical analysis used was performed using SPSS for Windows version 12.0 software. Descriptive statistics were presented as mean $\pm$ standard deviation (SD). The independent sample t-test was used for analysis where appropriated; a probability value of < 0.05 was considered significant.

Results

Seventy-two women fulfilling the criteria had amniocentesis during the study period. Twenty-four participants (33.3%) had the needle inserted at middle third and 48 participants (66.7%) had the insertion at upper third. The patients' characteristics are described in Table 1. The mean age of the participants was 36.3 ± 3.2 [standard deviation (SD)] years. The median parity was 1, with a range of 0 to 3. The mean gestational age was 17.7 ± 1.5 weeks. The mean height and weight were 156.4 ± 6.2 centimetres and 58.3 ± 10.7 kilograms, respectively. The mean body mass index (BMI) was 23.9 ± 4.3 kg/m^2. No significant differences between groups were detected except for the height of the patients. However, there was no significant difference in BMI.

The indications for amniocentesis were advanced maternal age (88.9%), history of chromosomal abnormality (4.2%) and other (6.9%). Three patients underwent multiple procedures; two procedures were performed twice and one procedure was performed three times. All samples of amniotic fluid collected had clear colour and no complications were reported. The mean intensity of pain after amniocentesis with the use of VAS (minimum 0 and maximum 10) was 2.7 ± 2.2. The patients with the insertion of the needle into the upper third of the uterus had the mean VAS of 2.2 ± 1.9, which was significantly less when compared with the patients with the insertion at the middle third with the mean VAS of 3.9 ± 2.2 ($p = 0.002$; 95% confidence interval [CI] = -2.6 to -0.7) (Table 1). As shown in Table 2, the patients with previous amniocentesis had no statistically significant difference in VAS compared with the patients who had undergone amniocentesis for the first time. There was also no significant difference between the patients with and without previous abdominal surgery. An insertion through placenta and operators' experience (staff or fellows) also revealed no impact on the intensity of pain.

Discussion

Pain is a complex sensation that varies in perception from individual to individual. Maternal pain in amniocentesis relates to maternal anxiety but is still frequently overlooked. The patients are usually insufficiently counseled about the pain due to the lack of data and physicians' concern. In addition, the pain is inadequately studied and analysed. Multiple clinical correlates were proposed to affect maternal pain but the data was limited to only a few studies[2-6].

A review of the literature with the use of PubMed, from 1996 to the present, (search terms:

Table 1. Patients' characteristics

	Upper third (n = 48)	Middle third (n = 24)	p-value	95%CI
Age (years)				
Mean ± SD	36.3± 2.7	36.1±4.0	0.796	-1.4, 1.8
Range	27-44	26-42		
Gestational Age (weeks)				
Mean ± SD	17.7±1.4	17.7±1.5	1.0	-0.7, 0.7
Range	17-21	16-20		
Weight (kilograms)				
Mean ± SD	57.2±10.7	60.6±10.7	0.214	-8.6, 2.0
Range	40-86	44-86		
Height (centimeters)				
Mean ± SD	155.3±6.5	158.7±4.8	0.026	-6.4, -0.4
Range	135-168	150-165		
BMI (kg/m^2)				
Mean ± SD	23.8±4.5	24.1±4.2	0.792	-2.4, 1.9
Range	16.2-35.3	17.5-32.9		
VAS				
Mean ± SD	2.2±1.9	3.9±2.2	0.002	-2.6, -0.7
Range	0.3-7.8	0.6-8.8		

CI, confidence interval; SD, standard deviation
BMI, body mass index; VAS, visual analog scale

Table 2. Clinical correlates of the patients

	No. (%)	VAS (Mean ± SD)	p-value	95%CI
Previous amniocentesis				
Yes	7 (9.7)	3.4±2.5	0.789	-1.0, 2.4
No	65 (90.3)	2.7±2.1		
Previous abdominal surgery				
Yes	27 (37.5)	3.2±2.3	1.493	-0.3, 1.8
No	45 (62.3)	2.5±2.0		
Needle insertion through placenta				
Yes	23 (31.9)	2.5±2.0	0.480	-1.5, 0.7
No	49 (68.1)	2.9±2.3		
Operator				
Staff	7 (9.7)	3.0±2.5	0.757	-1.5, 2.0
Fellows	65 (90.3)	2.7±2.1		

CI, confidence interval; SD, standard deviation
VAS, visual analog scale

amniocentesis and pain) reveal 5 previous studies[2-6]. Only one study examined pain association with the location of needle insertion[2]. Harris et al[2] reported that insertion of the needle into the lower one third of the uterus was a predictor of increased pain with amniocentesis. Our study found that pain was statistically less significant in the patients who were punctured at the upper one third of the uterus than the patients with the needle insertion at the middle one third. The pre-chosen needle location by the researchers was unapplicable because of the ethical limitation. The location was decided by the operators based on the location of the fetus and the placenta.

The significantly less pain in the patients with the needle insertion at upper third of the uterus may result from a more concentrated nerve supply to the lower uterus and cervix. The uterus receives its afferent sensory fibres from the inferior hypogastric plexus[7].

Most of these fibres enter the uterus through the broad ligaments on each side of the cervix. In addition, the lower uterine segment is still relatively small during the second trimester, the passage of the amniocentesis needle through the lower uterus may stimulate a larger number of afferent fibres than in the upper uterus.

Ferber et al[3] reported that a history of previous amniocentesis was the only variable that was associated with reduced pain. In contrast, Harris et al[2] noted that a history of previous amniocentesis was associated with significantly greater perceived pain. Our study showed no statistically significant difference between these two groups. The conclusions that can be drawn from previously mentioned studies, with respect to the effect of previous amniocentesis on pain perception, are limited because of the small number of subjects (9.7% in our study, 12% in the report of Harris et al and 19% in the report of Ferber et al).

Local anaesthetic is not used routinely at our institution before genetic amniocentesis and was not used in this study. A randomized study has shown that local anaesthesia with 1% lidocaine did not decrease the pain, as measured by the VAS, during amniocentesis in the second trimester[6].

In conclusion, according to the results of our study, we may be better equipped to counsel a patient about the severity of pain that she might experience during the procedure. This, itself, may decrease the anxiety and perceived pain during amniocentesis. Even though the location of placenta and fetal part are prioritized in the consideration of needle insertion for the best fetal safety, we should choose the needle insertion location at the upper one third of the uterus or the location that is upper and closest to the fundus. Hopefully, this will decrease the maternal pain experienced in amniocentesis.

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ตำแหน่งของการเจาะดูดน้ำคร่ำกับความเจ็บปวดของมารดา

นวมลล์ เล็กสกุล, เยื้อน ตันนิรันดร

วัตถุประสงค์: *เพื่อเปรียบเทียบความเจ็บปวดที่เกิดจากการเจาะดูดน้ำคร่ำที่ตำแหน่งต่าง ๆ ของมดลูกมารดา และความสัมพันธ์ของความเจ็บปวดกับปัจจัยอื่น ๆ ของมารดา*

วัสดุและวิธีการ: *การศึกษาแบบไปข้างหน้า ในสตรีตั้งครรภ์ที่มารับการเจาะดูดน้ำคร่ำที่หน่วยเวชศาสตร์มารดาและทารกในครรภ์ โรงพยาบาลจุฬาลงกรณ์ ตั้งแต่วันที่ 1 ตุลาคม พ.ศ. 2548 ถึงวันที่ 31 ธันวาคม พ.ศ. 2548 ผู้ศึกษาได้ประเมินความเจ็บปวดจากการเจาะดูดน้ำคร่ำโดยใช้ Visual Analogue Scales (VAS) หลังจากนั้นจึงวัดตำแหน่งที่เข็มเจาะดูดน้ำคร่ำแทงผ่านบริเวณหน้าท้องของมารดาโดยใช้สายวัด วัดระยะทางจากยอดมดลูกไปกระดูกหัวหน่าวและระยะทางจากตำแหน่งที่เข็มเจาะไปยังกระดูกหัวหน่าว นำมาคำนวณและแบ่งตำแหน่งที่เข็มเจาะเป็นสองบริเวณ คือ ด้านบน เศษ 1 ส่วน 3 ของมดลูกและกึ่งกลางของมดลูก*

ผลการศึกษา: *ข้อมูลจากสตรีตั้งครรภ์ที่มารับการเจาะดูดน้ำคร่ำ 72 ราย ได้นำมาวิเคราะห์พบว่า ความเจ็บปวดโดยเฉลี่ยจากการประเมินโดย VAS เท่ากับ 2.7 $\pm$ 2.1 และความเจ็บปวดในกลุ่มสตรีตั้งครรภ์ที่ได้รับการเจาะดูดน้ำคร่ำที่ด้านบนของมดลูกน้อยกว่ากลุ่มที่ได้รับการเจาะดูดน้ำคร่ำที่กึ่งกลางของมดลูกอย่างมีนัยสำคัญทางสถิติ (VAS 2.2 ต่อ 3.9, p = 0.002) ประวัติการเจาะดูดน้ำคร่ำมาก่อน, ประวัติการผ่าตัดของมารดา, การเจาะดูดน้ำคร่ำผ่านรกและประสบการณ์ของผู้เจาะดูดน้ำคร่ำไม่มีผลต่อความเจ็บปวด*

สรุป: *มารดาที่ได้รับการเจาะดูดน้ำคร่ำที่ด้านบน ของมดลูกมีความเจ็บปวดน้อยกว่ามารดาที่ได้รับการเจาะดูดน้ำคร่ำที่กึ่งกลางของมดลูก*