Ultrasonography-guided amniocentesis in singleton pregnancies: a review of the first 1,000 cases

G.O. Ajayi

Department of Obstetrics and Gynaecology, College of Medicine, University of Lagos, Idi-Araba, Lagos (Nigeria)

Summary

Objective: To assess factors that might influence the success rate, safety and reliability of amniocentesis. *Design:* A retrospective study analyzing of the outcome of the first 1,000 cases of amniocenteses. *Setting:* The outpatient clinic of prenatal diagnosis and therapy laboratory of a University tertiary care centre. *Method and Material:* A review of the first 1,000 amniocentesis procedures performed at the Prenatal Diagnosis and Therapy Centre is presented. Medical records were reviewed for maternal age, indication, color of amniotic fluid, gestational age, frequency of needle insertion, complications of amniocentesis, pre delivery results of prenatal testing and pregnancy outcome. Complete follow-up data were available for 968 (96.8%), and in 42 cases reports were not complete. *Results:* There were 21 miscarriages before 28 weeks of gestation (2.2%), three losses after 28 weeks (0.3%) and six stillbirths (0.6%) (4 due to infections) resulting in a total post procedural loss rate of 3.1% (30). Miscarriage within two weeks of amniocentesis occurred in six patients (0.62%). *Conclusion:* Amniocentesis is a relatively safe and reliable method of prenatal diagnosis. It must be done by experienced personnel.

Key words: Amniocentesis; Abortion; Still birth complication.

Introduction

Prenatal diagnosis of chromosomal, biochemical and neural tube defects has been widely accepted as a routine procedure in the management of obstetric cases. A spectrum of diagnostic procedures is now available to meet these demands and includes chorionic villus sampling (transcervical or transabdominal), cordocentesis, embryoscopy, earlier and conversional amniocentesis, and recently analysis of fetal cells in maternal circulation [1, 2]. Experience performing amniocentesis with the use of continuous ultrasound (US) guidance is presented [3-10].

Material and Method

The prenatal diagnosis program at the College of Medicine of the University of Lagos, Lagos started using the amniocentesis procedure in 1988. Data were evaluated for amniocentesis indications, gestational age at the time of amniocentesis (weeks since last menstrual period ± 1 week), color of amniotic fluid, pregnancy complications before amniocentesis, delivery complications, amniocentesis complications and pregnancy outcome. For comparison with published studies, pregnancy loss data were divided into the following categories: two weeks after amniocentesis, < 28 weeks gestation miscarriage, ≥ 28 weeks gestation (stillbirth) and neonatal death (within 1 week of birth). Loss data were further evaluated as to a possible or probable relationship to amniocentesis. The technique of amniocentesis used in our program has previously been reported by Holzgreve *et al.* [7] (Figure 1). Siemen Vidoson (Siemens AG, Erlangen, KretzTechnik Combison 350S) Austria Ultrasound equipment was used for this purpose with a 20 or 22 gauge spinal needle.

Revised manuscript accepted for publication July 28, 2010

Results

The indications for amniocentesis are shown in Table 1. Complete follow-up data were available for 968 cases (96.8%) and in 42 cases reports were not complete. There were 21 (2.2%) miscarriages before 28 weeks of gestation, three (0.3%) losses after 28 weeks and six (0.6%) still births (four of the cases due to viral infection, cytomegalovirus, rubella and parvovirus). The total post procedure loss rate was 30 (3.1%). Miscarriages within two weeks of amniocentesis occurred in six (0.62%) patients (Table 2).

The frequency of needle insertion is shown in Table 3. A total of 879 (90.8%) amniocenteses were successfully performed with a single needle insertion. Repeat tapping was required in 77 (8%) patients because of inadequate fluid volume obtained during the procedure. The volume of amniotic fluid obtained at amniocentesis was between 3 ml and 45 ml with a mean of 18.2 ml. In those patients with normal outcomes coloured amniotic fluid was obtained in 49/968 (5%) of the amniocenteses. A total of 22/968 (2.3%) of patients required rescheduling.

Table 2 shows the total number of patients who had complications within two weeks of amniocentesis. A total of 934 (96.5%) did not have any problems, while 11 (1.1%) had amniotic fluid leakage of several days duration.

The overall loss rate of desired pregnancies in the study was 3.1% (30/968).

Discussion

Concern regarding the safety and hazards of prenatal diagnostic procedures have resulted in numerous reports with regard to mid-trimester amniocentesis [6, 11-14]. One report [15] evaluated the safety and efficacy of chori-

Table 1. — *Indications for amniocentesis.*

Indication	No. of patients	%
Maternal age	458	47.3
Maternal anxiety	47	4.86
Family history of chromosome abnormality	11	1.14
Oligohydramnious	88	9.1
Polyhydramnious	238	23.4
Pregnancy at risk of metabolic disease	102	10.54
Family history/prior child with neural tube defect	10	1.03
Rule out viral infection	33	3.42

Table 2. — *Complication of amniocentesis within two weeks of the procedure.*

Complication	No. of patients	%
None	934	96.5%
Fluid leakage	11	1.12%
Miscarriage < 2 weeks	6	0.62%
Cramping	8	0.83%
Bleeding	9	0.93%
Total	968	100

Table 3. — *Frequency of needle insertion.*

No. of insertions	Frequency	%
1	878.9	90.8%
2	79.4	8.2%
3	9.7	1.0%
Total	968	100%

Table 4. — *Pregnancy outcome for 968 patients undergoing amniocentesis.*

Outcome	No. of patients	%
Male	501	51.8%
Female	465	48%
Other	2	0.2%
Fetal abnormality-terminated	16	1.7%
Abortion < 28 weeks gestation	21	2.2%
Abortion > 28 weeks gestation	3	0.3%
Miscarriage within 2 weeks after amniocentesis	6	0.62%
Abnormal child not detected prenatally	2	0.2%
Small for gestational age	2	0. 2%
Still birth	6	0.62%

onic villus sampling and showed a combined loss rate (simultaneous and missed abortion, termination of abnormal pregnancies, stillbirths and neonatal deaths) for desired pregnancy of 7.2% in the chorionic villus sampling group and 5.7% in the amniocentesis group. After data adjustment it was concluded that the difference in loss rate for the two groups was 0.8%.

In the present study overall loss rate of desired pregnancies was 3.1%, although it was difficult to establish an entirely comparable figure for the study population.

It has long been considered that 15% to 20% of recognized pregnancies result in spontaneous abortion before 20 weeks of gestation. Lin *et al.* [16] followed-up 1,068 pregnancies that were confirmed to be normal by US (before 14 weeks gestation) until 28 weeks gestation. They reported an overall 2.7% spontaneous abortion rate with 1.5% occurring before week 16 and 1.2% between 16 and 28 weeks of gestation. They suggested that there was also a slightly higher spontaneous abortion rate (1.8% vs 1.3%) between 11-16 weeks' gestation for primigravid patients as compared with multiparous patients. Threatened miscarriage was associated with a 38% fetal loss rate. This may have been a factor in some of our losses.

Gilmore and McNay [17] followed-up 2,144 pregnancies that were established as normal by US before ten weeks of gestation. An overall 2.1% spontaneous abortion rate occurred. This rate tended to increase with increasing maternal age, being 2.6% between ages 35 to 39 years and 13.6% at age ≥ 40 years.

It should be noted that the 1976 National Institution of Child Health and Human Development study of amniocentesis published a 3.2% spontaneous abortion rate for their control group of women matched for race, gravidity and family income [11]. However, these pregnancies were not shown to be normal by US before amniocentesis.

In conclusion, continuous US guidance appears to decrease the risk of amniocentesis and add to the technical care of obtaining amniotic fluid samples. It is a relatively safe and reliable method in prenatal diagnosis and therapy but must be done by experienced personnel. Recent large uncontrolled studies suggested that procedure-related loss rates of around 0.5% can be achieved [18-20].

References

[1] Holzgreve W., Miny P.: "Chorionic villi sampling with an echogenic catheter: experiences of the first 500 cases". *J. Perinat. Med.*, 1987, *3*, 244.
[2] Brambati B., Oldrini A.: "CVS for first-trimester fetal diagnosis". *Contemp. Obstet. Gynaecol.*, 1985, 94.
[3] Daffos F., Capella-Pavlovslay M., Forestier F.: "Fetal blood sampling via the umbilical cord using a needle guided by ultrasound". *Prenatal. Diagn.*, 1983, *3*, 271.
[4] Golbus M.S., Kan Y.W., Naglich-Craig N.: "Fetal blood sampling in midtrimester pregnancies". *Am. J. Obstet. Gynecol.*, 1976, *124*, 653.
[5] Golbus M.S.: "The status of fetoscopy and fetal tissue sampling". *Prenat. Diagn.*, 1984, *4*, 79.
[6] Golbus M.S., Loughmann W.D., Epstein C.J., Halbasch G., Stephen J.D., Hall B.D.: "Prenatal genetic diagnosis in 3000 amniocentesis". *N. Engl. J. Med.*, 1979, *300*, 157.
[7] Miny P., Holzgreve W., Pawlowitzki I.H.: "Amniozenteprogramm Muenster: Erfahrungen nach 7000 Eingriffen". In: Holzgreve W. (Hrsg) Praenatale, Medizin Springer, Berlin, Tokyo S., 1987, 1.
[8] Nicolaides K.H.: "Cordocentesis". *Clin. Obstet. Gynecol.*, 1988, *31*, 123.
[9] Ganshirt-Ahlert D., Burschy M., Garritsen H.S. *et al.*: "Magnetic cell sorting and the transferrin receptor as potential means of prenatal diagnosis from maternal blood". *Am. J. Obstet. Gynecol.*, 1992, *166*, 1350.
[10] Simpson J.L., Sherman E.: "Isolating fetal cells from maternal blood advances in prenatal diagnosis through molecular technology". *JAMA*, 1993, *270*, 2357.

[11] National Institute of Child Health and Human Development National Registry for Amniocentesis study group: "Mid-trimester amniocentesis for prenatal diagnosis: safety and accuracy". *Can. Med. Assoc J.*, 1976, *115*, 739.
[12] Simpson N.E., Dallaire L., Miller J.R., Siminovich L., Hamerton J.L., Miller J., McKeen C.: "Prenatal diagnosis of genetic disease in Canada: report of a collaborative study". *Can. Med. Assoc. J.*, 1976, *115*, 739
[13] Crandall B.F., Howard J., Lebher T.B., Rubenstein L., Sample W.S., Sarti D.: "Follow-up of 2000 second trimester amniocenteses". *Obstet. Gynecol.*, 1980, *56*, 625.
[14] Phillip J., Bang J.: "Outcome of pregnancy after amniocentesis for chromosome analysis". *Brit. Med. J.*, 1978, *2*, 1183.
[15] Rhoads G.G., Jackson L.G., Schlesselman S.E., de la Cruz F.F., Desnick R.J., Golbus M.S. *et al.*: "The safety and efficacy of chorionic villus sampling for early prenatal diagnosis of cytogenetic abnormalities". *N. Engl. J. Med.*, 1989, *320*, 609.
[16] Liu D.T., Jeavons B., Preston C., Pearson D.: "A prospective study of spontaneous miscarriage in ultrasonically normal pregnancies and relevance to chorionic villus sampling". *Prenat. Diagn.*, 1987, *7*, 223.
[17] Gilmore D.H., McNay M.B.: "Spontaneous fetal loss rate in early pregnancy". *Lancet*, 1985, *1*, 107.
[18] Tabor A., Phillip J. Madsen M., Bangs Obel E.B., Norgaard-Pedersen B.: "Randomised controlled trial of genetic amniocentesis in 4606 low risk women". *Lancet*, 1986, *1*, 1287.
[19] Horger E.O. 3rd, Finch H., Vincent V.A.: "A single physician's experience with four thousand six hundred genetic amniocenteses". *Am. J. Obstet. Gynecol.*, 2001, *185*, 279.
[20] Scott F., Peters H., Boogert T., Robertson R., Anderson J., McLennan A. *et al.*: "The loss rates for invasive prenatal testing in specialized obstetrics ultrasound practice". *Aust. M.Z.J. Obstet. Gynecol.*, 2002, *42*, 55.

Address reprint requests to:
G.O. AJAYI, M.D.
Department of Obstetrics and Gynecology
College of Medicine/University of Lagos
P.M.B. 12003 Idi-Araba Surulere, Lagos (Nigeria)
e-mail: prenataldiagnosiscentre@hotmail.com