Ultrasound Aspiration Biopsy Transducer Amniocentesis

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SUMMARY

Amniocentesis through an ultrasound aspiration biopsy transducer was performed 156 times. The technique is described and our results are presented. By closely monitoring the fetus and the needle entry into the amniotic cavity, we have avoided serious complications. The importance of adequate genetic counselling for the procedure is stressed, as most cases fall into the second trimester group, and the procedure is indicated in order to try to prevent inheritable disorders. The importance of continual monitoring of the fetus before, during and after the procedure is pointed out, and recommendations are made to avoid difficulties and complications in amniocentesis.


Amniocentesis is a recognized procedure in obstetrics, either in early or in late pregnancy. Because the volume of amniotic fluid is too small for adequate sampling before about 16 weeks' gestation, early pregnancy amniocentesis is, in fact, performed during the second trimester when there is approximately 200 ml of amniotic fluid present. Late pregnancy amniocentesis is most frequently performed in the 35+ weeks' gestation period. Amniocentesis is now used almost exclusively for diagnostic rather than therapeutic purposes. Early or midtrimester amniocentesis is the more common — in this series 125 out of 156 punctures (±80%). By this means, many inheritable disorders can be diagnosed and the parents may therefore be offered an abortion if they so desire, thus preventing the birth of a child with chromosomal abnormalities. The purpose of this communication is to present our results with amniocentesis performed by ultrasonic guiding of the needle into the amniotic cavity.

METHODS

It has now been clearly established that ultrasound can play a significant role in any aspiration or biopsy procedure. It follows that for amniocentesis a clear indication also exists for the use of ultrasound. In the most elementary situation, it can be used solely to locate the placenta, amniocentesis then taking place at another venue or another time. This method has its drawbacks, especially in the case of an anterior placenta, and the fetus, which is constantly moving, is not monitored and may therefore be liable to injury. The uterine shape may alter, possibly as a result of Braxton Hicks contractions, and the placental site may be wrongly localized. Some authors have constructed simple guide attachments, so that the needle, which is loosely applied to the ultrasound probe, can be guided into the amniotic cavity with ultrasonic assistance.

In 1972, an ultrasound aspiration biopsy transducer was described by Goldberg and Pollock which made it possible to guide the needle into the amniotic cavity under direct vision. A special transducer is available (Fig. 1) which contains a central hole or slot; while the B scan is being performed, the needle is guided through the hole or slot to wherever is desired, its tip being constantly visible on the A scale (Fig. 2). Surprisingly, even though the needle is advancing parallel to the sound waves, an echo pattern is produced by the tip of the needle which is clearly recognized on the A scale, resulting in a disruption of the sound volume, this disruption being directly proportional to the volume of the needle. Since the amplitude of the echo is only that of a solid-solid interface, the settings of the equipment must be high. Thus, under direct vision, the pitfalls of aspirating maternal blood or urine or causing harm to the fetus can be avoided. In this series, all amniocenteses were performed by means of an ultrasound aspiration biopsy transducer.

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TECHNIQUE

It is of fundamental importance that before amniocentesis is carried out, a thorough ultrasonic examination is done; in our experience this is greatly assisted by the use of grey scale. Primarily, the fetus is examined to establish its viability and whether it has a head.

Real-time ultrasound is of particular value for studying fetal movements and heart action and identifying spinal abnormalities. After establishing the presence of a normal fetus, the placental site is located. It is of importance to establish the gestational age precisely so that amniocentesis may be performed at the optimal time. The probe is then exchanged for the biopsy transducer, which has been sterilized by cold methods, the one most commonly used being the ethylene oxide gas method. In the same room, after adequate skin preparation and application of drapes, the abdomen is rescanned as a sterile procedure. This is done in order to locate a placenta-free and fetus-free area. The needle tip is then guided at a favourable site into the amniotic cavity through the biopsy probe, its tip being constantly monitored on the A scale. It it necessary to advance the needle rapidly through the skin and into the amniotic cavity, thus making recognition of its travel easy. Occasionally, the use of an M-mode sweep pattern may facilitate needle visualization. When the operator is satisfied that the needle is in position, fluid is aspirated, and then the needle may be withdrawn.

The patient is advised to rest for 24 hours and to report immediately any discomfort, vaginal bleeding, or leakage of amniotic fluid. After completion of the procedure, the fetus is re-examined by real-time ultrasound to check its movements and heart action. Puncture sites must be chosen as close as possible to the midline to avoid damage to epigastric vessels. Fundal punctures are not only easy and painless but the possibility of aspirating maternal urine, which may occur when unmonitored suprapubic punctures are used, is avoided. A large anterior placenta may cause difficulty and the operator often has to introduce the needle above or below it (Fig. 3). In late pregnancy, amniocentesis for maturity estimation may be difficult, especially in the case of intra-uterine growth retardation when amniotic fluid volume is diminished. It may be of value to have an assistant elevate the head for a suprapubic puncture (Fig. 4). Continuous ultrasonic monitoring of the fetus is of particular importance throughout the procedure, as the fetus often moves excessively.

RESULTS

Amniocentesis was performed 156 times, 125 times in the second trimester and 31 times in late pregnancy. The 125 punctures were performed on 115 patients and the 31 punctures on 26 patients. The gestational distribution is depicted in Figs 5 and 6. Placentas were anterior in 80 punctures and posterior in 76. In the 115 patients in the
second trimester, 4 abnormalities were detected — 2 with Down syndrome (1 male and 1 female), 1 with Tay-Sachs disease and 1 with anencephaly (initially detected by a raised serum α-fetoprotein level).

**COMPLICATIONS AND PITFALLS**

**Twins**

Twins must be correctly diagnosed, as normally the α-fetoprotein level is elevated and, for amniocentesis, both gestation sacs must be entered. In this series, one set of twins was not diagnosed by ultrasound. Two other sets, however, were correctly diagnosed before amniocentesis.

**Culture Failure**

On 6 occasions, the laboratory failed to culture cells. We were able to repeat the puncture in 5 of these cases with successful results.

**Stained Fluid**

A bloody tap occurred on 3 occasions, in 1 subject with a posterior placenta, in 1 at term, and in 1 with an anterior placenta. Dark fluid aspirate was obtained on 2 occasions due to placenta praevia with previous bleeding, once at 22 weeks and once at 35 weeks. Occasionally blood will be aspirated with the amniotic fluid although the placenta is untouched. This is thought to be due to entry of the needle into superficial blood vessels on the anterior wall. If aspiration is continued, bleeding soon stops, and a clear tap will then be obtained by changing the syringe. This occurred 8 times in our second trimester patients.

**Failure to Obtain Fluid**

Failure to obtain fluid occurred on 3 occasions, twice at 14 weeks and once at 18 weeks with no obvious cause. Amniocentesis was repeated 2 weeks later with success. The fourth case was one of severe intra-uterine growth retardation with no amniotic fluid. Even when the needle is undoubtedly in the amniotic cavity, the flow of clear fluid may on occasion stop. Aspiration can continue if the needle tip is rotated or slightly repositioned. The cause is obscure but it is thought that thin intra-amniotic septa abutting the needle tip are freed by the slight repositioning. This occurred 14 times in our second trimester subjects.

**Vaginal Bleeding**

One patient had a vaginal bleed after the procedure, which had been performed at 16 weeks. It soon stopped with conservative therapy and pregnancy continued.

No further complications occurred in this series.

**DISCUSSION**

Requests for amniocentesis in second trimester subjects in our clinic are increasing rapidly, confirming the experience reported by Jenkins and Kamberg. By far the most common reason for the request is for genetic counselling, especially in women over 35 years. Although these women comprise only 13.5% of all pregnancies, they produce 50% of the cases of Down syndrome (trisomy 21). At 40 they have a 1% risk of producing an infant with the syndrome; at 45, the incidence is 1 in 40. Advanced maternal age is our commonest indication for amniocentesis, as reported by others. As yet, X-linked recessive conditions such as Duchenne's muscular dystrophy and haemophilia cannot be diagnosed prenatally but, because only males are affected, determining the sex of the fetus and selective abortion of males will prevent the birth of a possibly affected child from a known maternal carrier.

Neural tube anomalies are easily diagnosed by the raised α-fetoprotein levels; with modern ultrasonic apparatus and especially with real-time modes, the fetal spine can be well seen. Serum α-fetoprotein estimations are now considered to be an excellent screening procedure; when the level is significantly raised, ultrasound examination and amniocentesis are indicated. An excellent table of indications for midtrimester amniocentesis was published by Jenkins (Table I). In late pregnancy, our main indication is for pulmonary maturity estimation by the study of lecithin values and the lecithin-sphingomyelin ratio. This is of particular value in the case of intra-uterine growth retardation and toxæmia. More rarely nowadays, amniocentesis is done to estimate maturity in cases of Rh incompatibility with rising antibody titres.

Until the present time, it has generally been accepted

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<th>TABLE I. INDICATIONS FOR MIDTRIMESTER AMNIOCENTESIS</th>
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<tr>
<td><strong>High risk</strong></td>
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<tr>
<td>Chromosomal — when one parent is a balanced translocation carrier (1:5 - 1:20)</td>
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<tr>
<td>Recessive biochemical disorders — when both parents are carriers (1:4)</td>
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<tr>
<td>Congenital anomalies — when a couple have had 2 affected children, e.g. spina bifida (1:10)</td>
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<tr>
<td><strong>Moderate risk</strong></td>
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<tr>
<td>Chromosomal — previous non-dysjunction Down syndrome (1:100). Maternal age 40 (1:100 or higher)</td>
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<td>Spina bifida — in high-risk situations (1:100) or when an affected child has been born (1:20), or when one parent has the condition (1:30)</td>
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<td><strong>Low risk (less than 1:100)</strong></td>
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<tr>
<td>Down syndrome and advanced maternal age (35 - 40 years), when risk may be as low as 1:500 but when parents may be anxious.</td>
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that there is a 1% complication rate for amniocentesis. Our complication rate is below 1% and we have seen no serious consequences. It may, therefore, be safely assumed that with close supervision amniocentesis is safe and harmless.

What of the yield? In this series, we have found 4 anomalies in 115 patients (3.5%). This corresponds with Jenkins’s figure of 5.2% and that of Finley et al. It is of interest to note the participants’ reactions to amniocentesis and prenatal genetic studies. Finley et al. found that the majority of husbands favoured the test. Most couples found the experience rewarding and worth while and thought that the experience could be improved if referring doctors would explain the procedure and the results expected to the patients. Adequate genetic counselling for the procedure is essential, and amniocentesis should only be carried out by practitioners who are adequately trained in the technique.

REFERENCES

The Use of Human Chorionic Gonadotrophin in Recurrent Abortion

S. W. SANDLER, P. BAILLIE

SUMMARY

Important unresolved problems associated with recurrent abortion are aetiology, prognosis and management. This communication describes hormonal monitoring in pregnancy of groups of patients treated with human chorionic gonadotrophin (HCG). The outcome is compared with that in an untreated normal group and an untreated group with recurrent abortions.


A Reproductive Failure Clinic was established at Groote Schuur Hospital, Cape Town, with a view to the investigation and management of pregnant women who fail to reproduce satisfactorily. This enabled us to identify possible causes of recurrent abortion. The establishment of the Gynaecological Endocrine Laboratory provided a further opportunity for in-depth study of the sex hormone values in plasma during pregnancy and therefore allowed research into the hormonal aspect of recurrent abortions and its ultimate treatment. Recurrent abortions were considered the best to study because the incidence of abortion in a subsequent pregnancy is thought to be high. For treatment of these pregnancies human chorionic gonadotrophin (HCG) (Pregnyl; Organon) was selected. Previous reports of the investigation of recurrent abortion have been published, outlining causative factors and management, and effective clinical and biological response to HCG administration in threatened and recurrent abortion has been documented. In order to substantiate these effects and to avoid the therapeutic nihilism that follows anecdotal reports on HCG usage, the following biochemical trial was conducted.

PATIENTS AND METHODS

Four groups of pregnant patients were selected for the study: group 1 - 15 normal primigravidas; group 2 - 13 pregnant women with a history of three or more recurrent abortions, treated with 10 000 IU HCG; group 3 - 10 pregnant women with a history of three or more recurrent abortions, treated with 40 000 IU HCG; group