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Ophthalmic Complications of Amniocentesis

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Summary
Reports of ocular damage from amniocentesis needles are rare. We report four cases of ocular perforation in which an amniocentesis needle may have been the cause and a proven case of central nervous system perforation during amniocentesis which resulted in hemianopia and gaze palsy. Ocular damage during amniocentesis may be commoner than the paucity of reports would suggest, and should be considered in all cases of congenital ocular conditions.

Amniocentesis was introduced in 1930[1] as part of the technique of amniography to determine placental position in cases of painless bleeding in the third trimester of pregnancy. Since then the technique has been mainly used in the management of haemolytic disease of newborn, assessment of fetal maturity, and prenatal genetic diagnosis.

Most amniocenteses now take place in midtrimester, and although some studies point to a slightly increased risk of fetal loss,[2,3] the NICHD group in 1976[4] concluded that amniocentesis was a 'highly accurate and safe procedure that does not increase the risk of fetal loss or injury.'

There are, however, numerous reports in the literature of fetal damage caused by needle puncture during amniocentesis, and we describe four cases of presumed ocular injury and one proven case of optic tract damage following midtrimester amniocentesis.

Case 1

The mother of this child underwent amniocentesis at 16 weeks gestation because of maternal age. Preceding ultrasonography showed an anterior placenta with consequently only a small area of uterus through which to perform the amniocentesis. The increased risks of the procedure were explained to the mother who elected to proceed. Amniocentesis proved difficult, only 2ml of blood stained liquor being aspirated following two needle insertions. Subsequent analysis of the fluid revealed an alphafetoprotein (AFP) of 240mg/l (normal 36mg/l at 16 weeks gestation). Acetylcholinesterase (ACH) assay showed two bands to be present. The blood in the sample was 100% fetal. Cytogenetic results of the cultured cells showed a normal male karyotype-46XY. The raised AFP was thought to be due to the presence of fetal red blood cells and that the two bands of ACH could be the result of a cerebral puncture. The diagnosis of fetal puncture, probably cerebral, was made and consequent ultrasonography suggested a minor dilatation of one ventricle. The mother elected to continue the pregnancy. Following delivery by Caesarean section at 38 weeks, a small scar was noted in front of the right fronto-parietal suture, but the child appeared otherwise normal. Early ultrasonography suggested a cystic lesion communicating with the right lateral ventricle, and the possibility of damage to the right optic tract by the amniocentesis

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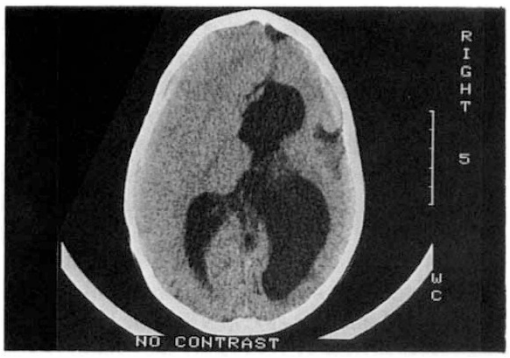

Fig. 1. *CT scan of case 1 showing dilated right lateral ventricle, prominent Sylvian fissure and right sided cortical atrophy.*

needle was considered. Ocular examination was normal.

The child appeared to progress satisfactorily for seven months but although he responded to sounds on the left by turning his head, he did not turn his eyes. Left sided motor development was slow, with poor use of the left hand and reduced movement of the left leg. Clinically, he had a left homonymous hemianopia, although visual evoked potential on pattern reversal showed no consistent hemisphere asymmetry.

At seven months, fitting began with an episode of status epilepticus, controlled by medication. CT scans showed moderate dilatation of the right lateral ventricle and lesser dilatation of the left occipital horn. The left frontal horn appeared to arise like a diverticulum from the right. Prominent interhemisphere fissure and right Sylvian fissure indicated atrophy rather than compression by the dilated right anterior horn. (Fig. 1).

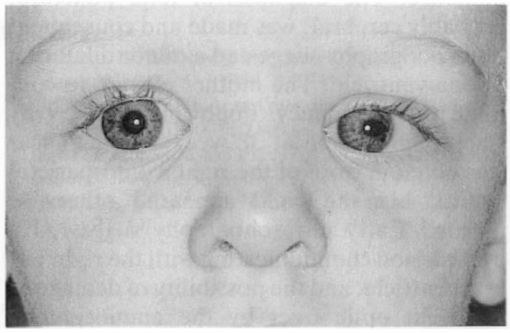

Fig. 2. *Case 2 with pupil peaked to corneal perforation.*

At the age of 14 months, he still had a left homonymous hemianopia and a marked gaze defect to the left, although there had been some improvement as he did generate occasional saccades to the left.

Case 2

The mother of this child underwent amniocentesis/chorionic villus sampling at 30 weeks gestation (by dates) for chromosomal analysis (subsequently normal) and because of intrauterine growth retardation and oligohydramnios. On ultrasound, the placenta was found to be lying posteriorly and laterally with the fetus in a cephalic presentation. Despite two attempts under ultrasound guidance, no villus fragments were aspirated. Following delivery at 31 weeks because of fetal distress, weighing 715 grams, the baby required special care for hypoglycaemia, thrombocythaemia, hypoalbuminaemia, chest infection, and cholestatic jaundice following an episode of necrotising enterocolitis. His respiratory problems, however, did not necessitate more than three days of 30% oxygen.

Following discharge his parents noted his left pupil was abnormal and he was subsequently seen in our eye department at nine months of age. On examination, visual acuity in both eyes was within normal limits (by forced choice preferential looking). The right pupil was round, central and normally reacting. The left pupil was distorted towards the 3 o'clock position with a small tag of iris drawn up towards a full thickness corneal scar. There was no cataract, and fundus was normal. (Fig. 2).

Case 3

This child was noted to have a left esotropia from birth, the parents also noting that the left eye appeared smaller than the right. The mother underwent amniocentesis at 16 weeks gestation because of maternal age, with subsequent delivery of an otherwise normal girl at 38 weeks (labour being induced because of maternal hypertension). The child was seen by us at 10 months of age. On examination, the left eye was microphthalmic, with reduced visual acuity, esotropia and limitation of abduction. Anterior segments appeared normal, but fundus examination revealed a

chorioretinal scar in the temporal periphery with obvious overlying vitreous condensations. The view was not good enough to identify any incarceration (Fig. 3).

Case 4

A three and a half year old boy came to an ophthalmology department with a mild conjunctivitis. Visual acuity was 6/5 in both eyes with no refractive error. He had no past history of eye problems or head injury. Slit lamp examination revealed a small adherent leukoma near the limbus at 7 o'clock. No lens opacity was seen and fundus examination was normal. His 34 year old mother had undergone amniocentesis at 15 weeks gestation. The appearance of the child's eye was consistent with an earlier perforating injury, and in the absence of any other history of injury could have been caused by the amniocentesis needle.

Case 5

A 5 year old girl attended an eye casualty with a small chalazion on her right upper lid. Examination showed a small full-thickness scar near the limbus at 9 o'clock. Visual acuity was normal, the lens clear and fundus normal. Her mother could not recall any previous trauma, but had amniocentesis performed during the mid trimester, suggesting a possible cause for the corneal scar.

Details of the amniocentesis are not available for the last three cases.

Discussion

Reports of fetal damage during amniocentesis include abdominal perforation,[5] pneumothorax,[5,6], central nervous system perforation,[5] and limb and trunk puncture.[5,7–12]

Several large studies have specifically examined newborns for signs of needle puncture, with varying results. The NICHD group[4] found no evidence of skin puncture in 1040 children following amniocentesis, either as newborns or at one year, and Tabor[13] no scars in 2302 newborns.

However, Epley *et al*[7] found a 9% frequency of fetal injury following mid trimester amniocentesis in 107 infants, Finegan *et al*[3] a 5.5% incidence in 91 cases, Broome *et al*[11] 4% in 100 cases, and Karp *et al*[8] a 2.1% occurrence in 190 cases.

The majority of needle punctures present as non-pigmented dimple like marks on the chest, back, and limbs and are often overlooked at birth, becoming more apparent during infancy due to tethering caused by subcutaneous scar tissue.[3,7,9]

Creasman[5] points out that there is often very little evidence of abdominal puncture following intrauterine transfusion a few days prior to birth, and that fetal skin healing is very rapid.

Ocular injuries are rare, only five isolated cases being described in the American literature,[14–18] with no ocular damage being reported in the larger series.

Of the cases described here case 1 has a gaze palsy and hemianopia which must be due to the proven amniocentesis puncture.

In cases 2 and 3, the ocular abnormalities were noted by the parents at birth. The findings in case 2 were compatible with a limbal perforating injury, the amniocentesis needle being the most likely cause. In case 3, microphthalmos, a chorioretinal scar and restricted abduction could, we feel be explained by a posterior perforation with lateral rectus damage.

Cases 4 and 5 had signs of previous anterior segment perforations. These could obviously relate to a previous injury occurring at any time between birth and presentation, but the lack of any history of trauma or other eye problems leads us to suggest that amniocentesis needle perforation is a possible cause.

The eye is still at an active stage of development during the mid-trimester, and the lids still fused. One might therefore expect more evidence of ocular disruption from such perforating injuries than found in our cases, with evidence of lid damage.

Of the five previously reported cases, three describe anterior segment perforation,[14,15,16] two following amniocentesis near term (34[14] and 37[15] weeks gestation) and one mid trimester (19 weeks[16]). None developed any vision although two cases were initially noted to have clear media and normal posterior poles. A further case describes a posterior segment perforation following midtrimester amniocentesis at 17 weeks with leukocoria and total

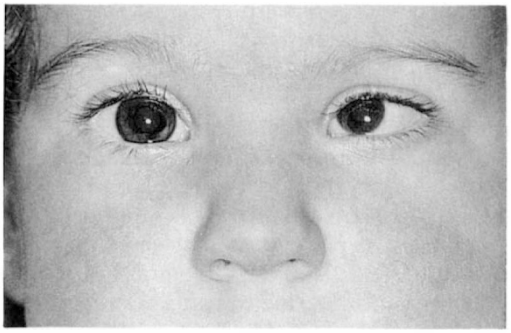

Fig. 3. *Patient 3.*

retinal detachment.[18] The anterior segment was normal in this case and the retinal architecture mature, the detachment being due to traction from vitreous incarcerated in the perforation. The final case describes a post-limbal perforation associated with a sealed contra-coup retinal tear with surrounding pigmentation, no lenticular damage and useful vision, following amniocentesis at 20 weeks gestation.[17] This report therefore shows that minimal ocular disruption can follow ocular perforation during fetal life.

Of the three midtrimester reports, only one notes a lid notch.[16]

It is possible that cases of ocular damage following amniocentesis are commoner than the paucity of reports would suggest, but do not present if symptoms and signs are minimal. Although large reviews have failed to find any ocular damage following amniocentesis the same can be said of skin perforation, a complication which undoubtedly does occur.

Previously reported cases of fetal injury occur despite preceding ultrasonography. The advent of real-time ultrasonography (Fig. 3) with guidance of a small bore needle (21/22 G) may improve the safety of amniocentesis[19,20] and reduce the risk of fetal injury. In more recent reports, Tabor[13] found no scars in 2302 newborns following mid-trimester amniocentesis, and Tatayama[21] none in 500 cases.

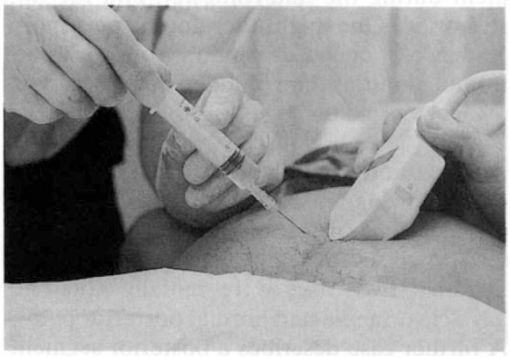

Fig. 4. *Amniocentesis performed under real-time ultrasonography.*

Of our two cases where details of the amniocentesis are available (Cases 1 and 2), one was performed with real-time ultrasonography and both were undoubtedly difficult procedures. Real-time was unlikely to have been available when cases 4 and 5 underwent amniocentesis although as with case 3, a preceding scan was likely to have been performed.

We therefore suggest that ocular damage during amniocentesis may be commoner than originally thought. We would agree with Merin and Beyth[16] that prenatal trauma should be considered in the differential diagnosis of congenital ocular conditions.

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