Ultrasonic Observations of the Vitreous Body Immediately Following Cataract Extraction

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Abstract. An A-scan ultrasound examination of the vitreous body was performed in 50 cases of cataracta senilis, both immediately preceding the operation and twice following. In 4 cases, the vitreous body was acoustically homogeneous, and in another 4 extensive degeneration was observed both before and after the operation. In 42 cases the vitreous body was acoustically slightly heterogeneous. Cataract extraction did not affect the acoustic structure of the vitreous body. In 16 cases the other eye had been similarly operated on an average of 2 years earlier; in all cases the acoustic structure of the vitreous body in this eye was similar to that in the eye now operated on.


Introduction
Over the last 15 years, it has been demonstrated that degenerative changes in the vitreous body due to aging can be observed by means of ultrasonography, and that there is a close correspondence between the ultrasonic and the optical findings (Bellone 1968; Gärtner and Löpping 1968; Löpping and Gärtner 1968; Rossi and Gallenga 1971; Oksala 1975). In a study involving the ultrasonic observation of the vitreous bodies of 444 healthy eyes, we found that up to the 20th year of life the vitreous body is homogeneous; between the ages of 21 and 40 years degeneration is observed in 5% of individuals, between 41 and 50 years in 19%, between 51 and 60 in over 60%, and in subjects over 60 years of age in approximately 90% (Oksala 1978a). In a study concerning the effect of aphakia on the structure of the vitreous body after an average duration of 2 years, it was found that aphakia in itself did not significantly increase the degeneration of the vitreous body (Oksala 1980).

In the present study, the structure of the vitreous body was observed immediately following cataract extraction, both ultrasonically and in many cases also with the slit lamp. The ultrasonic findings were also compared to findings obtained by observing the patient's other aphakic eye.

Material and Methods
The total number of patients was 50, divided by age as follows: 4 patients 55-60 years old, 9 patients 61-65 years, 13 patients 66-70 years, 22 patients 71-80 years, and 2 patients 81-90 years of age. In 16 cases a similar operation had been performed earlier on the other eye; this operation had taken place 1-9 years earlier, with an average of 2 years. The eyes on which these earlier operations had been performed were in other respects healthy, and no significant complications had occurred.

All the operations included in the present study were performed intracapsularly, with chymotrypsin and cryoextraction. The wound was closed with 6-10 sutures. In three cases a slight loss of vitreous humour occurred; there were no other operative complications.

The apparatus used in the ultrasound observation was a Kretztechnik instrument, model 7100 MA, with a slightly focused transducer of 6 MHz/5 mm. The eye was first anesthetised with a eye-drop, after which the transducer was pressed against the conjunctiva and the sclera, with the beam aimed past the lens into the vitreous space. Both eyes were first examined prior to the operation, at maximum amplification; after that the operated eye was examined on the day 2-4 and again on day 7-10 after the operation. In 16 cases, as noted, it was also possible to examine the vitreous body of the other eye, which had been operated on for cataract previously.

The echoes reflected from the vitreous body were defined as low, if the relative amplitude of the echo at maximum amplification was at most 5 dB. The echo was defined as medium with a relative amplitude of 10 dB, and as high with an amplitude of 15-20 dB. It may be mentioned that the echo from a detached retina is still observable at a relative intensity of the apparatus of 40 dB.

Results
Four of the typical echograms obtained in the research are shown in Fig. 1. In Fig. 1 A, the vitreous body is represented at maximum intensity by the zero line; in other words, the vitreous body is acoustically homogeneous. In Fig. 1 B,
there are two or three low (3-5 dB) echoes reflected from the vitreous body, in Fig. 1C there are several echoes 5-10 dB in height, and in Fig. 1D the degeneration of the vitreous body yields a number of echoes, at times as high as 5-15 dB.

In four cases, no echoes from the vitreous body were observed after the operation either. These patients were 60, 61, 71, and 72 years of age, respectively. Three of the four also showed no signs of vitreous degeneration when examined with the slit lamp. In another four patients, aged 69, 74, 76 and 83 years, respectively, the vitreous body yielded occasional echoes both prior to and after the operation, varying greatly in amplitude from 5-20 dB.

In a majority of cases, similar slight degeneration of the vitreous body was observed both immediately prior to the operation and after it. In a typical case, the vitreous body was at times homogeneous and at times reflected 1-4 echoes, with a relative amplitude of 5-10 dB. The locations and amplitudes of the echoes on the screen varied rapidly, and at times the vitreous body was represented just by the zero line.

In 16 cases it was possible to examine the vitreous body of the other eye, which had been operated on earlier for cataract. In all of these cases, some degeneration of the vitreous body was observed, corresponding in occurrence and degree to that observed for the eye just operated on.

Discussion

The purpose of the investigation was to observe the immediate effect on the vitreous body of a cataract extraction, using an ultrasound technique. The A-scan technique was used in order to find and measure especially the low echoes due to vitreous degeneration. At this point, ultrasonography was considered both an easier and more reliable technique than optical examination; ultrasound made it possible to ascertain the structure of the entire vitreous space, without either disturbance or injury to the operated eye. In 16 cases it was possible to show that the acoustic structure of the vitreous body immediately following the operation was the same as that prevailing after an average of 2 years' aphakia.

As has been reported on a number of occasions previously, there is close agreement between the acoustic and optical findings concerning the structure of the vitreous body. In this work it was once more found that a small number of aged patients show a vitreous body, which is both acoustically and optically similar to that of young subjects. An acoustically homogeneous vitreous body was observed in 8% of all eyes examined. While three patients showed some loss of vitreous humour, this was not accompanied by any difference observable either acoustically or optically between this and the other eye of the same patient.

This work gives grounds for the conclusion that a normal cataract extraction, occurring without complications, does not in itself cause any changes in the condition of the vitreous body, either acoustically or optically observed. Opacities of the vitreous body arising from acute iritis or uveitis would certainly have been revealed by ultrasound examination alone (Oksala 1978b).

These findings confirm earlier observations (Oksala 1980), according to which aphakia in itself does not increase degeneration or opacity of the vitreous body to any note-

Fig. 1. A An acoustically homogeneous vitreous body. B The vitreous body reflects 2-3 low echoes (arrow). C The echoes now include two with an amplitude of 10 dB. D All the echoes are 5-15 dB in amplitude.