CATARACT EXTRACTION WITH ALPHA-CHYMOTRYPSIN* A CONTROLLED TRIAL

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It seemed necessary to verify, by a controlled trial, the reported action of alpha-chymotrypsin in loosening the suspensory ligament and facilitating the operation of intracapsular extraction. Many authors have praised the use of this enzyme and given clinical impressions of its value, but in none of these series have controls been used.

Trial Procedure

First fifty intracapsular extractions were performed in an uncontrolled series so that the operator should become thoroughly familiar with the technique.

In order to make a true assessment fifty ampoules were prepared by the hospital pharmacist with their accompanying ampoule of diluent, and these were numbered 1 to 50. Some of the ampoules contained active A.C.T. and the others an inert substance. The numbered labels were so wrapped round that it was impossible to see into the ampoule and there was no way of knowing whether an active or inert substance was introduced into the eye. Case notes were made after each operation and the key was kept in a sealed envelope and not referred to until the end of the complete series.

All cases were operated upon under general anaesthesia, and the section was a small von Graefe section enlarged with scissors without a conjunctival flap. One pre-placed groove suture and four post-placed sutures were inserted. After the introduction of the unknown solution and the recommended wait of 3 minutes, the iris was fully retracted under the raised cornea and the lens grasped tangentially at 12 o'clock as near as possible to the equator with Arruga's forceps under direct vision.

Using this method of direct application it was possible to assess at once whether the lens was free and whether the solution in the ampoule was inert or otherwise.

Forward presentation of the lens has been suggested as an invariable factor after the introduction of A.C.T. but this was not my experience and the appearance of the lens showed no alteration. On a few occasions there was some difficulty in getting the forceps to grip as the capsule seemed tense.

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In these cases the small hand erisophake ascribed to Dastoor proved to be a most valuable instrument, and with either it or the forceps the percentage of successful intracapsular extractions can be raised to a very high figure indeed. The mechanical erisophake was not employed and, indeed, its use would not appear necessary.

If the lens was not freely mobile the following plan was adopted:

(1) An attempt was made to remove the lens by the usual sliding method but this was not pursued if there seemed to be any difficulty.

(2) A second introduction of A.C.T. (known to be good and not obtained from the trial series) was made and the 12 o'clock grasp was repeated.

(3) If (2) failed the lens was removed by the tumbling method by grasping at 6 o'clock.

In two cases the lens had to be removed extracapsularly.

The Verhoeff sliding technique was used in all the successful cases. The method may not be ideal as a routine but it seems to be the best when A.C.T. is used and it provides a perfect method of assessing the strength of the zonule as the whole procedure can be viewed by direct inspection under the cornea.

In no case was external pressure applied either below or above during the trial. If the lens was not completely free it was considered that the solution had failed to act. External pressure would have undoubtedly increased the number of successes but would have biased the results.

Results

These are significant in that they show that A.C.T. has a definite action in freeing the lens and aiding extraction in most cases, but there was a proportion of exceptions (Table, opposite). The results may be classified in five groups:

(1) *Active A.C.T.* yielding a good result (G).—There were 28 of these, a success rate of 28 out of 32 (82 per cent.).

(2) *Inactive substance* yielding a poor result (B with O).—There were 10 of these, and it might be reasonable to add the three uncertain cases (U with O), which gives a total of thirteen out of eighteen.

This means that, if (1) and (2) are taken together, 41 cases out of 50 behaved as might be expected, the use or non-use of the active substance being correctly detected.

Further consideration must be given to those cases in which substance used was not recognized:

(3) *Active A.C.T.* yielding a poor result (B alone).—Two cases.

One of these patients (Case 13) was a male diabetic aged 34. The lens was quite immobile and the capsule ruptured at 12 o'clock but was removed extracapsularly.

The other (Case 15) was aged 73, and again the lens appeared to be immobile.

TABLE
RESULTS OF A.C.T. CONTROLLED TRIAL IN FIFTY CASES

Case No.	..	..	..	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Extraction	..	..	..	U	G	G	B	G	G	G	G	B	U	G	G	B	G	B	G	U
Substance Used	..	..	..			O	O					O	O							O

Case No.	..	..	..	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Extraction	..	..	..	G	G	B	G	G	G	G	G	G	B	G	G	G	G	B	B	B
Substance Used	..	..	..			O				O			O			O		O	O	O

Case No.	..	..	..	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Extraction	..	..	..	G	G	G	B	G	U	G	B	G	G	B	G	G	U	G	G
Substance Used	..	..	..			O	O		O		O			O				O	

Each case was recorded immediately after operation as follows:

- G Easy extraction—lens well dislocated and removed freely without undue traction.
- U Uncertain—difficult to judge whether lens was free but still removed in capsule.
- B Lens not free.
- O *Inert* substance introduced (18 cases). This factor was not discovered until the whole trial had been completed.

(4) *Inactive substance* yielding a poor result (G with O).—Five cases. These patients were aged 84, 71, 87, 84, and 68 years respectively, and it is clear that all those in the higher age group (except the last) show what would be expected, *i.e.* that the zonule is often quite free in old people.

(5) *Active A.C.T.* yielding uncertain results (U alone).—Two cases.

One of these patients (Case 1) was aged 56 and although the lens was extracted in capsule there was a slight vitreous loss. There was extreme bulging of the lens without any obvious pressure on the eye. This type of case is occasionally met with and usually does better if the lens is extracted extracapsularly.

The other (Case 48) was of some interest. The lens appeared quite fixed, and after the second introduction of A.C.T. from a source known to be active there was no alteration and the lens was still quite immobile. This was the only case which required a deliberate extracapsular extraction. The patient's age was 73, and one might have expected to find a free capsule.

Age.—The fifty patients fell into the following age groups: 30–39 years one case (No. 13, see Group 3 above), 40–49 years one case (No. 38, see Group 2 above), 50–59 years four cases, 60–69 years eight cases, 70–79 years

22 cases, 80–89 years fourteen cases. Those in the lower age groups require separate consideration:

Case 13 the male diabetic aged 35, showed good mydriasis. The lens was not free and the capsule ruptured at 12 o'clock, so that an extracapsular extraction was required. In this case the use of A.C.T. was a failure.

Case 38 was a woman aged 43. The introduction of the inert substance resulted in an immobile lens, but the subsequent introduction of A.C.T. known to be active resulted in a free and easy removal.

The results in the next age group 50–59 years are of little value as regards age assessment as they were probably all of the "senile" type.

Conclusion

Alpha-chymotrypsin has a useful action in freeing the lens and it increases the proportion of successful intracapsular extractions. Its action does not appear, however, to be absolutely constant. Out of 32 cases when the active substance was used there were two in which the lens did not become free, and out of eighteen in which the inert substance was used five gave a good result. (Four of the five, however, were very old people.)

Complications

Hill (1959) described a case of post-operative corneal oedema and vascularization, but no such case was seen in this series.

Barraquer (1959) described failure of wound healing with a tendency to subconjunctival filtration and striate keratitis. This series included two cases in which a small, pin-point bleb occurred, but it seemed to be due to a poorly-placed stitch.

There was also one case of severe and one of minor iris prolapse, and four cases of hyphaema which cleared up quickly.

This gave a rather higher proportion of complications than usual and, as Barraquer suggests, there may be some factor in A.C.T. which delays wound healing. Striate keratitis was also very common. It will, however, be noted that this trial involved a number of unnecessary intra-ocular manoeuvres, and in each case the keratitis cleared rapidly without ill effects.

In other words, if careful wound suturing is employed, the complications of using A.C.T. are extremely rare.

Summary

After an uncontrolled series of fifty cases using alpha-chymotrypsin (A.C.T.) in cataract extraction, a further series of fifty cases was treated with A.C.T. (32 cases) and an inert substance (18 cases). It was not known until the end of the trial which ampoules contained A.C.T. and which the inert substance.

The active substance was rightly detected in 28 out of 32 cases and the inert substance in thirteen out of eighteen cases (an accuracy rate of 82 per cent.). It was disappointing that in the only two patients under 50 years of age the efficacy of A.C.T. was uncertain.

Hyphaema occurred in four cases but cleared rapidly. There was one severe iris prolapse, and striate keratitis was common but cleared up rapidly.

This controlled trial shows that A.C.T. is a useful agent in intracapsular cataract extraction.

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