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Vitrectomy for Diabetic Eye Disease

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Summary

Thirty four eyes which underwent vitrectomy because of diabetic proliferative retinopathy were reviewed.

The overall success rate of the operation was 62%. Excluding table top retinal detachments, which all did badly, the success rate was 72%. Grading by ultrasound was found to be helpful in; (a) planning surgical approach, (b) assessing visual outcome. The most common late complication was cataract. Extracapsular cataract extraction with implantation was found to be successful in these cases.

The value of pars plana vitrectomy in the treatment of proliferative diabetic retinopathy complicated by vitreous haemorrhage and traction retinal detachment has been established.[1-5] Pre-operative factors associated with a poor visual prognosis have been identified.[6-9] The detection of retinal detachment by ophthalmic ultrasound is of particular importance.[10-13] We present our experience of vitrectomy for diabetic eye disease and emphasise the usefulness of grading patients by pre-operative ultrasound.

Materials and Methods

We reviewed retrospectively all diabetic eyes which underwent primary diabetic vitrectomy between November 1983 and May 1986. Thirty one patients were included, three had had bilateral operations, totalling 34 eyes. There were 20 females and 11 males with an average age of 53 years (24-75 years). Sixteen patients had Type I diabetes, the average duration of the disease being 28 years (18-45 years) and fifteen had Type II disease with an average duration of 12 years (2-30 years). (Table I). There were 22 right eyes and 12 left eyes.

Pre-operatively all patients underwent a full ophthalmic assessment with particular reference to visual acuity, relative afferent pupil defect, iris rubeosis, presence of lens opacity, pre-operative laser treatment, intraocular pressure and fundoscopy. The patients were assessed carefully with regard to cardiovascular, renal and neurological complications.

Ultrasound examinations were performed using the Triscan contact Ultrasound A and B scan with 8 MHz transducer with Vector A Scan facility. The B scan determined the anatomical relations of vitreous echoes and membranes to the retina and A scan determined the reflectivity characteristics. Table II lists the criteria used in differentiating retina from vitreous membrane.

The ultrasounds were all recorded on video-tape using a scan convertor and dynamic B scanning during ocular movements was recorded. All but two cf the examinations were carried out by one of the authors (STDR). The ultrasound was graded prognostically into Group 1-4 (Table III) as described by Jalkh et al.[10] (Fig. 1, a-d).

All surgery was performed by one surgeon (PSB) using common gauge (20 gauge) instruments. After removal of vitreous gel

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Table I

Type of DM	No. patients	No. eyes	Average duration of DM. (years)
1	16	19	28 (18 - 45)
2	15	15	12 (2 - 30)

Table II *Ultrasonic differentiation of vitreous membranes and retinal detachment*

Ultrasound	Retinal detachment	Vitreous membranes
B-scan		
Points of attachment	Ora serrata. Optic nerve	Variable
Mobility	Mild undulation – rigid	Very mobile – rigid
Submembrane space	Echofree	Echoes present
A-scan		
Reflectivity	High	Low-medium
Quantitative echography	6-15 dB	over 20 dB

the fibro-vascular membranes were peeled, segmented or delaminated as felt appropriate. New vessels were cauterised with an endo-probe binolar diathermy all retinal holes were treated with cryotherapy. Endo-laser photocoagulation was applied in a standard pattern when this instrument became available. Rhegmatogenous detachments were hydraulically re-attached by simultaneous fluid/gas exchange. Cryotherapy was applied to the post-oral retina in areas of sclerotomies. At the time of surgery the patients were grouped in line with the ultrasound grading.[1-4]

Table III

Ultrasound groups
1. Vitreous haemorrhage without vitreous traction.
2. Vitreo-retinal adhesion without traction retinal detachment. (V-shape)
3. Traction retinal detachment (focal adhesion, tent-X-shape)
4. Traction retinal detachment (multifocal adhesion, table top H-shaped)

Results

The follow up period ranged between 4 and 30 months (average 15 months). In 21 eyes (62%) the vision improved and in 11 (32%) the vision deteriorated. Analysing the visual outcome in each group revealed an improvement in 86% of Group 2 patients and 57% of Group 3 patients. All patients in Group 4 did badly. There were no patients in Group 1, i.e. with complete vitreous detachment, a finding consistent with a previous study.[13] Visual acuity deteriorated in 11 patients. Two operations were abandoned, one due to uncontrollable haemorrhage, the other due to an inoperable retinal detachment. In Group 2 one patient's eye became phthisical post-operatively. We attribute this to lensectomy, the absence of any pre-operative laser and inadequate operative photocoagulation. The remaining 8 failures are attributable to the development of late retinal detachment, from 2 weeks to 3 months post-operatively. All these patients had flat retina in the immediate post-operative period, seven of these eyes underwent fluid/gas exchange at the time of surgery. Excluding Group 4, i.e. table top traction detachments, the overall success rate was 72%. (Table IV and Scattergram Fig. 2). Figure 3-5 shows how visual acuity changed in each group.

Twenty eyes had pre-operative ultrasound, usually 2 days prior to surgery. In two cases the pre-operative ultrasound detected retinal detachment not noted in a previous

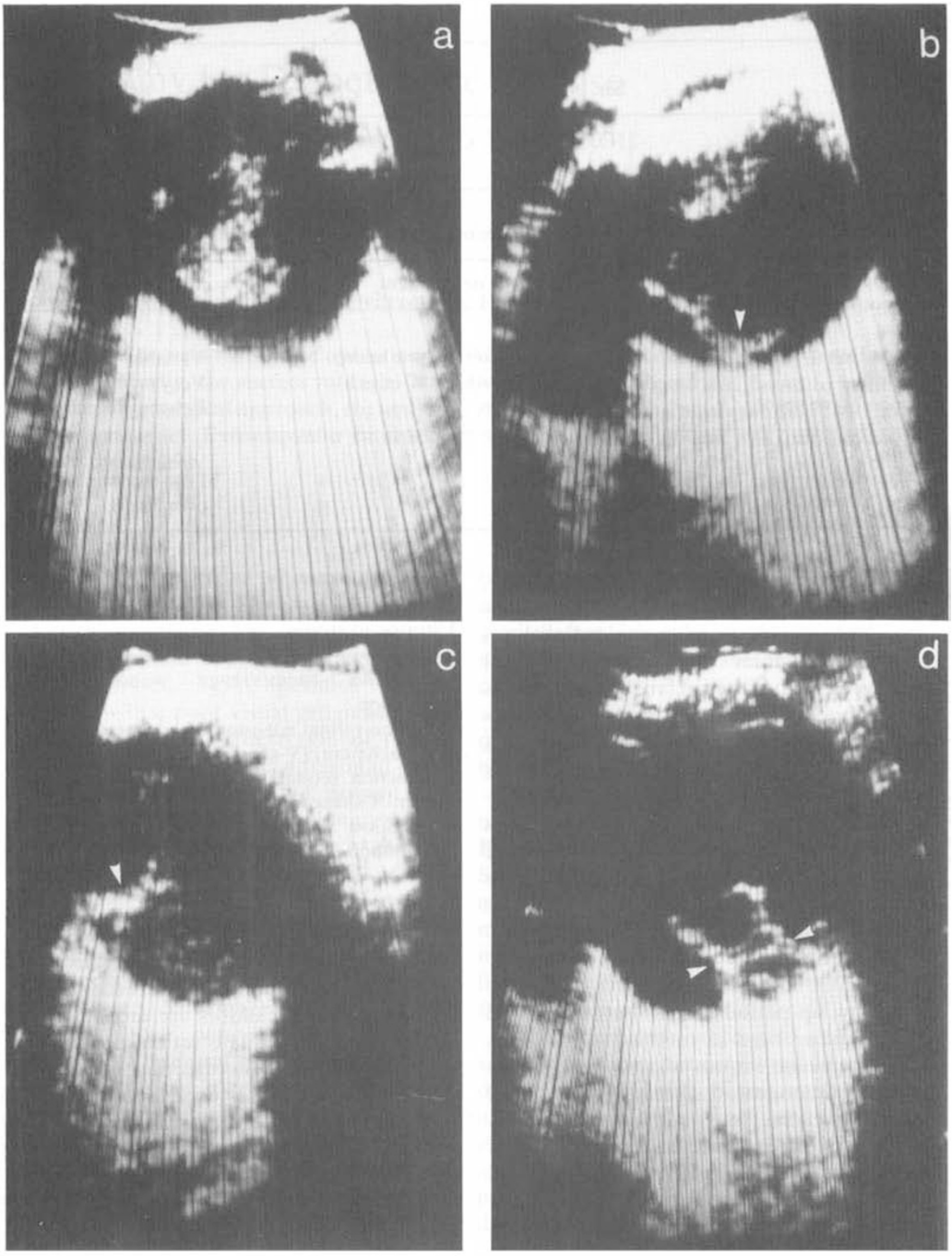

Fig. 1, a-d. *Tranverse B-mode images. a. Type 1 classification. Complete posterior vitreous detachment and intragel heamorrhage. Flat retina.*
b. Type 2 classification. Incomplete posterior vitreous detachment with focal adhesions. Intragel heamorrhage. Flar retina.
c. Type 3 classification. Posterior vitreous detachment inserting into localised tractional retinal detchment.
d. Type 4 classification. Posterior vitreous detachment inserting into "table top" tractional retinal detachment.

Table IV *Results*

Group	Eyes operated on	Visual acuity improved or the same (eyes)	Visual acuity worse than pre-op. (eyes)	Success rate (%)
2	22	19	3	86.3
3	7	4	3	57.1
4	5	0	5	0

ultrasound examination. Two eyes were wrongly classified when compared to the surgical findings, one should have been in Group 3, the other in Group 4. (Table V).

Three eyes had rubeosis iridis. The vision deteriorated in two following vitrectomy.

Twelve patients had intra-operative endo-laser, eight had improved vision post-operatively.

Two eyes with early improvement had to be re-operated because of re-current vitreous haemorrhage. One was a 24 year old male with vitreo-retinal adhesion and a flat retina pre-operatively. A primary procedure which included endo-laser photocoagulation proceeded without complication. He was a heavy smoker and 3 days post-operatively he developed laryngitis and a severe cough. This resulted in a re-bleed which had not cleared when last seen. The other patient was a 66 year old lady who had a vitrectomy because of Group 2 disease in January 1985. The vision improved for a few months but deteriorated again due to cataract. In January 1986 she had an extra-capsular lens extraction with Sinskey implant following which she developed filamentary keratitis which responded only slowly to topical treatment. She re-bled 2 months following the cataract operation requiring a vitreous cavity washout, following which her visual acuity improved.

Four eyes were aphakic at the time of vitrectomy. Three eyes had lensectomy during the operation and did badly despite two eyes being in Group 2.

Five eyes had extra-capsular lens extraction approximately one year after the primary vitrectomy, one of these had significant lens opacity before the vitrectomy. Four patients had a Sinskey posterior chamber

Table V *Accuracy of ultrasound (20 eyes)*

	Pre-operative ultrasound	Operative findings
Group 2	16	14
Group 3	3	4
Group 4	1	2

1 missed X-shaped detachments
1 missed H-shaped detachment

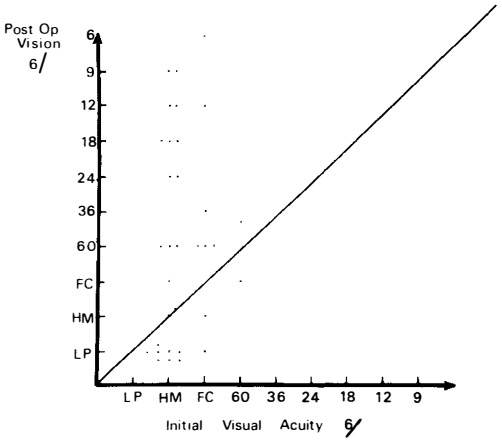

Fig. 2. *Scattergram showing visual changes following vitrectomy.*

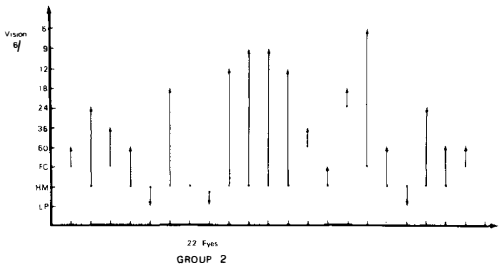

Fig. 3. *Visual changes following vitrectomy in Group 2.*

implant, no post-operative problems arose other than the filamentary keratitis described above.

One patient developed aphakic glaucoma and required trabeculectomy. Twenty eyes (59%) had pre-operative pan-retinal photocoagulation (1000-8000 burns). Fourteen eyes (41%) had less than 1000 burns. (Table VI). One patient died one year post-operatively from a myocardial infarction.

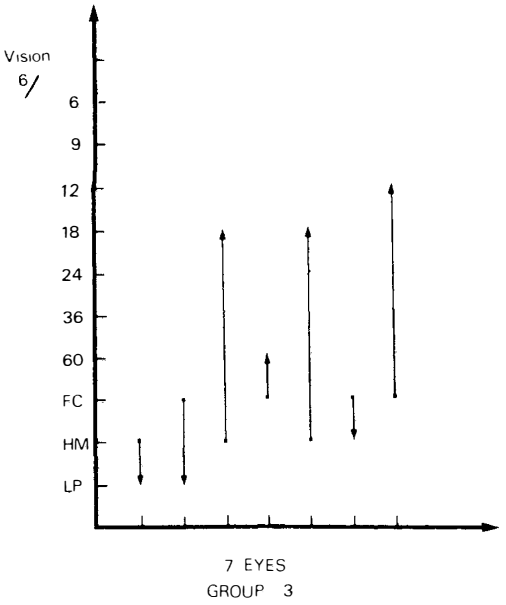

Fig. 4. *Visual changes following vitrectomy in Group 3.*

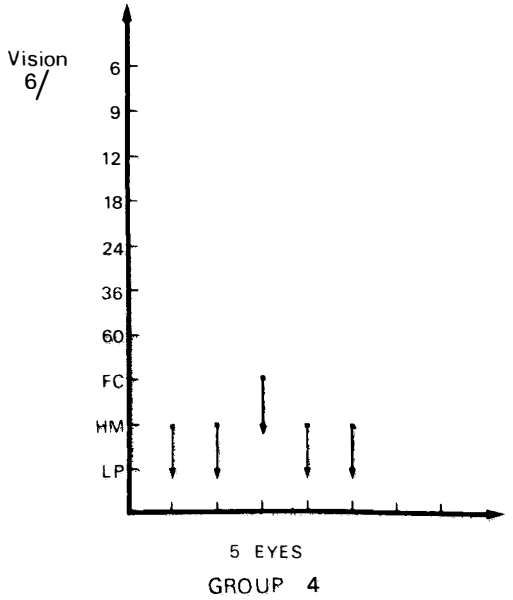

Fig. 5. *Visual changes following vitrectomy in Group 4.*

Discussion

Closed intra-ocular micro-surgery for complications of proliferative retinopathy offers hope of restoring useful and stable vision for many patients. From previous studies it is known that patients with vitreous haemorrhage without retinal detachment have the best visual prognosis.[1,3,4,14] Our findings of 86% success rate agree with this and it is interesting that 2 of the 3 patients who did badly in this group also had lensectomy, which is recognised as a poor prognostic association.[15,16]

The poor results with table top detachments have previously been commented on.[5] These patients are the most visually handicapped and therefore the most demanding of surgery despite a poor prognosis. Whether they should be more vigorously dissuaded from surgery is arguable. Excluding this group substantially improves the success rate of this type of surgery.

The pre-operative ultrasound grading used in this study proved to be of great value, not only in allowing a planned surgical approach but also enabling the surgeon to offer the patient a more accurate assessment of visual prognosis. We strongly advocate the use of video-tape recording of the ultrasound as this allowed dynamic features to be reviewed at leisure and discussed with colleagues. We would also like to emphasise the importance of performing ultrasound within days of surgery as these eyes show progressive and changing pathology.

The ultrasound of the two cases where retinal detachment was missed, were reviewed retrospectively. One had a shallow traction

Table VI

Photocoagulation	Eyes DM 1	Eyes DM 2
< 1000 burns	4	10
> 1000 burns	15	5

detachment at the point of adhesion of a vitreo-retinal membrane. The importance of searching carefully for retinal detachment at areas of vitreo-retinal adhesion has been commented on by previous authors.[10,13,17]

The ultrasound examination of the other case, which belonged to Group 4, was performed by a less experienced examiner. There were extensive vitreo-retinal adhesions with a shallow retinal detachment.

The most significant late complications in our series have been the occurrence of cataract, usually many months post-vitrectomy, and late retinal detachment usually within 3 months. The aetiology of these late retinal detachments is of interest. All exhibited evidence of reparative epiretinal fibrosis, many with obvious secondary retinal breaks, as described previously.[18] It is our feeling that some of these detachments could have been prevented by silicone oil exchange at the time of initial procedure. The indications for silicone oil in diabetic vitrectomy have not as yet been fully elucidated and are the subject of further study.

In our hands extra-capsular cataract extraction with implantation of a posterior chamber Sinskey style lens had proved very successful and without significant complication.

Despite the proven efficacy of laser photocoagulation in the treatment of proliferative retinopathy, it was disturbing to note the high proportion of patients who had received minimal photocoagulation. It is essential that a continuing programme of education for patients, physicians and ophthalmologists be continued to reduce the incidence of blindness from advanced diabetic eye disease.

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