DIODE LASER PHOTOCOAGULATION FOR RETINOPATHY OF PREMATURITY*

BY *Tianna Tsitsis*, MD (BY INVITATION), *William Tasman*, MD,
J. Arch McNamara, MD (BY INVITATION),
Gary Brown, MD (BY INVITATION), AND *James Vander*, MD (BY INVITATION)

ABSTRACT

Objective: The purpose of this study was to determine the effectiveness of laser photocoagulation in eyes with threshold retinopathy of prematurity (ROP), defined as stage 3+, zone 2, with 5 or more contiguous or 8 cumulative clock hours of extraretinal fibrovascular proliferation.

Methods: Indirect ophthalmoscopic retinal examinations were performed on 18 premature infants born between 1991 and 1993 to identify those eyes with threshold ROP. Diode laser was used to treat 31 eyes within 48 hours of diagnosis. Each patient was followed post treatment at weekly intervals until regression was starting to occur. Subsequent follow-up visits were tailored to each patient.

Results: During the 41 to 60 month follow-up (average 49 months, median 46 months), 27 of 31 lasered eyes (87%) demonstrated regression of the extraretinal neovascularization, and 26 (84%) had functional vision. This includes two Stage 4B eyes that were reattached with scleral buckles. Twenty-two eyes (71%) were myopic and four (13%) progressed to stage 5 retinal detachment that could not be repaired. No cataracts occurred in this group of patients.

Conclusions: Although a potentially blinding disorder, threshold ROP is, in many cases, treatable with laser photocoagulation, which may be easier to administer than cryotherapy. Follow-up of patients treated with diode laser demonstrates that functional vision is attainable.

INTRODUCTION

Retinopathy of prematurity (ROP) is a proliferative disorder of the retinal vasculature in premature infants.[1-4] The exact cause of ROP is unknown, but its origin is believed to be multifactorial.[1,3,5,6] Consistent findings in

*From Jefferson Medical College, Philadelphia (Dr Tsitsis), and the Department of Ophthalmology, Wills Eye Hospital, Philadelphia (Drs Tasman, McNamara, Brown, and Vander).

affected babies include shorter gestational age and lower birth weight.[1-4,7]

Fortunately, most eyes with ROP do not require treatment.[8] The International Classification of ROP (ICROP) is essential when deciding which infants require therapy.[3,9] At stage 1, 2, or 3, changes frequently regress spontaneously.[1,4,6,10] Threshold disease is defined as stage 3+, zone I or II, with 5 or more contiguous or 8 cumulative clock hours of extraretinal fibrovascular proliferation, and it is at this point that treatment is indicated.[1,3,7,10-12]

Recent advances in neonatal intensive care and, consequently, improved survival rates among premature infants have resulted in an increasing incidence of ROP, especially in babies of very low birth weight.[5,10,13] Following the Cryotherapy for ROP study, cryotherapy was the primary mode of treatment, but laser photocoagulation has now superseded cryotherapy in popularity.[6-8,10-12,14,15]

METHODS

This study was approved by the Institutional Review Boards of Wills Eye Hospital and Thomas Jefferson University. Before subjects were entered into the trial, informed consent was obtained.

The study group consisted of 18 premature infants born between September 1991 and August 1993. All babies received eye examinations within 4 to 6 weeks after birth to identify those eyes with threshold ROP.

Diode laser therapy was used in all treated eyes within 48 hours of diagnosis of threshold ROP. Thirty-one eyes were treated in the nursery with use of topical anesthesia. One eye not treated with laser had previously been treated with cryotherapy; the fellow eye received laser therapy. Thirteen patients received treatment to both eyes, and 4 patients received treatment to only one eye because of failure of the second eye to reach threshold ROP. The laser settings ranged from 250 to 500 mV and 0.2 to 0.3 seconds. From 700 to 2,000 or more burns were applied per treatment. Follow-up involved regular ophthalmologic evaluations by the ophthalmologist who performed the surgery or the patient's pediatric ophthalmologist. Average length of follow-up was 46 months.

RESULTS

Average birth weight of the 18 subjects was 765 g (range, 454 to 1,363), and average gestational age at delivery was 25.5 weeks (range, 24 to 31). Six eyes were classified as posterior zone 2 (as defined in ICROP) when treated, and 2 of these eyes progressed to stage 5 ROP.

The average time from birth to surgery was 11 weeks. Regression of ROP, characterized by disappearance of extraretinal fibrovascular prolifer-

ation, plus disease, and vascularization of the retina beyond the ridge, was noted in 27 eyes (87%). Twenty-six eyes (84%) were able to at least fix and follow at their most recent ophthalmologic examination. Refractive errors were noted in 25 eyes (81%). Myopia was most common and was noted in 22 (88%) of 25 eyes with refractive errors and 71% of all the eyes in the study. Fourteen of the myopic eyes had refractions (Table I). The spherical equivalents ranged from -0.25 to -18.00 diopters (average, -5.00). However, the eye at -18.00 diopters had received a scleral buckle, which may have influenced the degree of myopia. Even if that eye is excluded, the average degree of myopia was still slightly over -4.00 diopters.

Visual results were obtained using the Allen Kindergarten chart on 9 patients (18 eyes) (Table II). These ranged from 20/20 to no light perception. The 7 other patients with regressed ROP were evaluated by their ability either to fix and follow a target or to ambulate satisfactorily.

During the subsequent 41 to 60 months after surgery, the following changes were noted: retinal dragging in 16 eyes (52%), stage 4B retinal detachment in 2 eyes (6%), stage 5 retinal detachment in 4 eyes (13%), and a leukoma in 1 eye (3%).

Supplemental laser treatment was considered when the neovascularization had not regressed within 2 to 3 weeks. Six eyes (19%) required 3 treatments, and 4 eyes (13%) required 2 treatments. None of the study eyes developed a cataract, a definite complication of laser,[16-20] although 2 eyes treated in 1996 suffered that complication subsequent to this study. Intermittent bradycardia occurred in some infants during treatment but quickly resolved when laser therapy was suspended.

TABLE I: REFRACTIVE ERROR
(7 patients, 14 eyes)

J. R.	OD	-8.00
	OS	-8.00
N. P.	OD	-6.50
	OS	-6.50
A. H.	OD	-2.00
	OS	-2.25
D. W.	OD	-1.50 -1.00 cx90
	OS	plano -2.50 cx90
A. W.	OD	+0.50 -1.50 cx145
	OS	-2.25
R. B.	OD	-7.00 +1.00 cx120 (amblyopic)
	OS	-3.00 +0.50 cx30
C. V.	OD	-18.00 (scleral buckle) stage 4B (amblyopic)
	OS	-5.00 (scleral buckle) stage 4B

A total of 6 retinal detachments developed after laser surgery. Reattachment was not successful in any of the 4 eyes with stage 5 ROP, but successful reattachment with scleral buckling was achieved in the 2 eyes with stage 4B detachments.

DISCUSSION

It is important that all premature infants, especially those weighing less than 1,250 g and younger than 32 weeks gestational age, receive ophthalmologic evaluations within 4 to 6 weeks after birth.[1-3,7,11] Should ROP be found in its early stages (stage 1, 2, or 3 with fewer than 5 contiguous or 8 cumulative hours of extraretinal fibrovascular proliferation), no treatment is necessary, since spontaneous regression frequently occurs.[1,4,6,10]

In this study, 31 eyes of 18 infants with threshold ROP were treated with laser therapy within 48 hours of diagnosis. After an average follow-up of 46 months, 26 eyes (84%) have functional sight. The functional

TABLE II: VISUAL ACUITY (with correction) (9 patients, 18 eyes)

T. K.	OD	No light perception	Posterior zone 2
	OS	No light perception	Posterior zone 2
A. Q.	OD	20/200	Posterior zone 2
	OS	20/400	Posterior zone 2
S. Q.	OD	20/40	Posterior zone 2
	OS	20/30	Posterior zone 2
K. P.	OD	20/30	Zone 2
	OS	20/30	Zone 2
T. W.	OD	Enucleated (treated with cryotherapy)	Zone 2
	OS	No light perception	Zone 2
D. W.	OD	20/40	Zone 2
	OS	20/60	Zone 2
A. W.	OD	20/30	Zone 2
	OS	20/30	Zone 2
R. B.	OD	20/200(amblyopic)	Zone 2
	OS	20/80	Zone 2
A. S.	OD	20/25	Zone 2
	OS	20/20	Zone 2

results are as good as in the Cryotherapy for ROP study and correlate well with other laser studies.[8,11,12,14,15]

The Snellen acuities in the Cryotherapy for ROP study showed that while fewer treated eyes (31.5%) than control eyes (48%) were blind, there was a slight trend toward fewer eyes with a visual acuity of 20/40 or better in the treated (13%) versus control (17%) groups.[21] Because of the predominantly bilateral treatment and overall small number of eyes in this study, a similar conclusion could not be made.

Twenty-two (71%) of 31 eyes were myopic. In untreated eyes included in the Cryotherapy for ROP study, myopia was observed in only 20% of the children tested at 3, 12, and 24 months.[22] Lower birth weight and increasing severity of ROP were strong predictors of myopia and high myopia. The fact that all of the eyes in our study were treated is consistent with more severe disease and might be an explanation for our high incidence of myopia.

Another study, reported by Laws and coworkers,[23] compared 19 patients who received cryotherapy and 15 patients who received laser therapy. They concluded that eyes receiving laser therapy had a lower degree of myopia than eyes treated with cryotherapy. Other studies[24-27] have reached similar conclusions either with regard to the lowered frequency of myopia in patients receiving laser therapy versus cryotherapy or the degree of myopia.

Our findings of an average myopia of -4.00 to -5.00 diopters would appear to contradict their findings. However, in a separate ongoing study of 22 patients where one eye was treated with cryo and the other with laser between 1989 and 1992, we have noted that the cryoed eyes had an average spherical equivalent of -5.3 diopters compared to only -3.4 diopters in the laser treated eyes.

While our study is admittedly limited by its size, results suggest that at least in this group of eyes, laser photocoagulation was associated with a high incidence of myopia and proved to be an effective treatment for threshold ROP, with development of useful vision on long-term follow-up.

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DISCUSSION

DR JOSE S. PULIDO. The near infrared diode laser has been a welcome addition to our retinal laser photocoagulation armamentarium. In a retrospective, nonrandomized study, Dr Tsitsis and her colleagues present long-term results confirming earlier and more preliminary studies that show that transpupillary laser photocoagulation appears to be at least as effective as retinal cryoablation for the treatment of threshold retinopathy of prematurity (ROP) (Tables 1 and 2). [1-3]

There is, however, a complication of laser photocoagulation in these infants that is not seen with retinal cryoablation—the formation of infantile cataracts. The exact cause is unknown, but we have hypothesized that it may be related to absorption of the laser energy by the dense tunica vasculosa lentis.[4] This would explain the fact that although the exact incidence is unknown, cataracts appear to occur more frequently with use of transpupillary argon laser than with the infrared diode laser (Table 3).[5-7]

The patient's family needs to be aware of this complication because of the attendent risk of amblyopia. In cases where there is a very densely vascularized tunica vasulosa lentis and a poorly dilating pupil, alternatives to transpupillary laser photocoagulation may be warranted.

Dr Haller and coauthors show that transscleral diode retinopexy in conjunction with scleral buckling is as effective as scleral buckling with cryopexy for the repair of primary retinal detachments. The mean number of laser application was 137, markedly more than are required with retinal cryopexy. There was a 21% incidence of scleral thermal effects, which basically caused scleral thinning, a 22% incidence of breaks in Bruch's membrane, and a 22% incidence of intraocular hemorrhages.

It appears that the the effective energy required to cause a choroidal hemorrhage using a transscleral laser delivery system is lower than that required using a transpupillary binocular indirect delivery system.[8] The reason for this is that the transscleral laser energy is being absorbed by the overlying pigmented choroidal melanocytes. This is an inherent problem of this system and needs to be considered in every case prior to using it.

When would one consider using a transscleral laser system? In primary retinal detachments, routine use of the transscleral system rather than cryopexy or a transpupillary indirect laser delivery system is probably not warranted considering the number of applications required with the transscleral system and the chances for scleral and choroidal injury. In many cases of reoperation, a vitrectomy is required, so a transpupillary indirect laser delivery system or an endolaser system can be easily used.

One situation, however, may be especially suited for the use of transscleral laser. In premature infants, the choroidal melanocytes are poorly pigmented compared with the retinal pigment epithelium. Use of the tran-

TABLE I: COMPARISON OF STRUCTURAL OUTCOME IN LASER TREATMENT VERSUS CRYOTHERAPY FOR ROP

Study	Favorable outcome
Cryotherapy	
3.5 yr treated[2]	70%
3 .5 year untreated	50%
Laser	
Tsitis et al	77%
Cryotherapy	
5.5 yr treated[1]	73%
5.5 yr untreated	55%

TABLE II: COMPARISON OF VISUAL ACUITY RESULTS IN LASER TREATMENT VERSUS CRYOTHERAPY FOR ROP

Study	>20/200
Cryotherapy	
3.5 yr treated[2]	53%
3.5 year untreated	42%
Laser	
Tsitis et al	65%
Cryotherapy	
5.5 yr treated[1]	52%
5.5 yr untreated	38%

TABLE III: INCIDENCE OF CATARACT WITH CRYOTHERAPY AND LASER PHOTOCOAGULATION

Cryotherapy	0%
Argon indirect laser	6%-25%
Diode indirect laser	0%-6%?

scleral laser system would therefore not cause significant scleral thinning or choroidal hemorrhages, since the energy would be absorbed by the retinal pigment epithelium.[8] In cases where there is a dense tunica vasulosa lentis and threshold retinopathy of prematurity, this may be a useful alternative method of causing peripheral retinal photocoagulation while decreasing the risk of cataracts.

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GEORGE L. SPAETH, MD. Dr. Haller related the incidence of hemorrhage and scleral burns to the experience of the surgeon, but I didn't hear whether you felt that the incidence of hemorrhaging and scleral burns was related to the amount of power that was applied. My question for you is, "How did you decide on how much power to apply?" Glaucoma surgeons have used transscleral cyclophotocoagulation for a long time, and the amount of power that you used seems to be markedly greater than the amount of power that would be necessary. The next question is: Were the scleral burns in fact related to the amount of power? And finally, why did you choose to use what seems like such a high amount of power?

STEPHEN S. FEMAN, MD. The subject of Dr. Haller's presentation has interested me for a while. The time course for chorioretinal scar formation has been a concern of mine in the past. My colleagues at Vanderbilt University have initiated studies of this with our "Free Electron Laser" (FEL) and have been surprised by how rapidly a chorioretinal adhesive scar evolves with that tool. In contrast, the cryotherapy chorioretinal scar takes 72 hours to go from initiation to maximal adhesive strength. I would like to know about the time necessary for the development of the laser lesions described by Dr. Haller. Nevertheless, there is some uncertainty as to whether it is better for Dr. Haller to address this now in an abbreviated form, or for her to describe this feature in more detail in some future publication.

VINOD LAKHANPAL, MD. I would like to congratulate Julia on a very interesting work. My questions and experience come from my AOS thesis that I wrote on choroidal detachments and choroidal hemorrhage. I have been very interested in this subject and I had reported hemorrhagic choroidal detachments secondary to cryopexy during vitreretinal surgery. I have almost completely given up cryopexy in any retinal detachment work because of the danger of choroidal hemorrhage and detachments. The reason for that is that I perform vitrectomy and endo-drainage of the subretinal fluid and air fluid exchange followed by endolaser photocoagulation to the internal retinotomy. This technique eliminates cryopexy altogether for reattachment of the retina in retinal detachment cases. My incidence of choroidal detachment and hemorrhage has almost completely disappeared with this technique.

The only indication that I would ever find in using a diode scleral laser would be where I would localize and drain the subretinal fluid first and then apply the laser. Although most of the time I would put the buckle on and then use indirect laser to treat the break. Cryopexy, for example in high myopes causes significant choroidal hemorrhage and detachment with disastrous results as I have previously reported. I am sure that the same kind of problem will be seen with diode laser as with cryopexy. Actually, you might see even more complications because, as Dr. Pulido reported, laser energy has to go through the choroid, and since we all like to see some change of color around the retinal break to be sure that we are actually treating the hole, the total energy may be quite high. So, depending upon the amount of subretinal fluid through which the energy has to travel to reach the retinal break, you would have to have the amount of energy proportional to the amount of fluid necessary to treat the break. Therefore similar problems of choroidal hemorrhage and detachment may also be encountered after Diode Retinopexy.

JOHN T. FLYNN, MD. I would like to congratulate, as I have had the opportunity many times in the past, Dr. Tasman and his co-workers in Philadelphia who have really been way ahead of the curve in pioneering the use of better surgical therapies for retinopathy or prematurity. He and his group have really been the leaders in this and this paper is just another example of that. The myopia of retinopathy of prematurity is a fascinating myopia. These are very small eyes. They have very small spherical lenses that are close to the back surface of the cornea due to the shallow anterior chamber. I believe that this myopia, which is a very dynamic process in these infants, is primarily a refractive myopia affecting the anterior segment of the eye. Until we get a handle on what's happening to the optical constants of the eye, we are going to have difficulty explaining the big changes which occur in the refractive error of the eyes in a matter of months.

One of the things that really needs to be watched carefully is the visual acuity of these laser treated eyes. Why? In recent publications from the Cryo-ROP Study, there was a borderline statistically-significant finding of better visual acuity in the eyes which were allowed to spontaneously heal as opposed to those eyes that were treated with cryotherapy. I think the p value for this finding was something like 0.06. It is disturbing if it is confirmed in the cryo-treated eyes. If the vision over the long term in the cryo eyes is or becomes worse than those who have not been treated, we have to take a close look at that in the laser eyes as well and see what happens.

Finally, one other thing. The health care system, at least in Florida, has changed things remarkably. It has done it in a way that is not good for patient care. In South Florida, many small hospitals, because they can make money on premature babies, are now seeking and getting qualification as Level 3 nurseries. By keeping babies in such Level 3 nurseries, which are not truly Level 3 in terms of the care that they can give, we are seeing more babies who are well past threshold and have Stage 4A and even Stage 4B by the time they get to us. I wonder, Bill, if you are encountering that in Philadelphia?

Once again thanks for this paper.

DENNIS M. ROBERTSON, MD. There was an implication in your discussion that cryotherapy is associated with an increased incidence of macular pucker, Although we were able to demonstrate that excessive cryrotherapy in monkeys can cause fibrosis with localized vitreoretinal proliferation[1], there is little evidence to show that cryotherapy causes macular pucker when applied in a clinical setting. There are two papers that indirectly suggest that cryoretinopexy does not cause macular pucker. In a long-term follow-up on treated retinal breaks (which included many eyes treated with cryoretinopexy), among more than 300 eyes, the incidence of macular pucker before treatment was no different than the incidence after treatment.[2] We concluded that treatment of the retinal breaks in this retrospective treatment series did not cause macular pucker.[2] In another study we published in 1980, we attempted to correlate postoperative macular changes to the number of cryopexy applications among 173 eyes with retinal detachments that spared tbe macula. We did not see macular pucker in this series despite many of the eyes receiving more than 20 cryo applications.[3]

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MORTON COX, MD. I find Julia's list of complications of cryopexy interesting because the same complications were observed with diathermy. Diathermy was the modality of choice in the early days of my career. I can tell you that macular pucker and PVR were not an infrequent complication in those days.

We have laboratory evidence that suggests that cryo may be a greater stimulator of proliferation than other modalities but we have absolutely no controlled clinical data to substantiate that proposition. It might be possible, Julia, to organize a prospective trial comparing transcleral diode laser to cryoretinopexy because both modalities can be used with current scleral buckling techniques. I doubt that any of us would be willing to use scleral dissection and partial penetrating diathermy as a control for cryo but your diode instrument might prove to be a useful control to find out whether or not cryo really stimulates more intraocular proliferation.

MICHAEL J. ELMAN, MD. My congratulations to both Dr. Tasman and Dr. Haller. I think the only way to definitively answer the question of which is the better treatment, is through a randomized clinical trial. But, in the absence of that, I will pose the question differently. You are both experienced surgeons; to Dr. Haller, you are now doing a primary buckle. What would be your preferred method of fixing that patient and creating the adhesion? I do not have available, unless I go downtown, the transscleral method, but I favor the laser indirect application as part of a primary buckle. What would you do - use the laser indirect, cryopexy or the new laser? And, to Dr. Tasmam - having experience with cryopexy and laser, what would you recommend if you had a mother who says, "What do you think is the best thing for my baby?

JULIA HALLER, MD. Thank you all for your very good comments. You bring up a lot of important points.

I will address Dr. Elman first. In a primary buckle, I tend to use cryotherapy instead of diode laser if there is a problem with the media, for example capsular opacification, which makes it difficult to see a small laser mark and judge treatment effect. The transscleral laser is not as efficient as the cryoprobe for checking suspicious areas where there may be a small break--the small break will stand out better against the white background of a larger cryo freeze. A number of retina surgeons are now using the diode laser in preference over cryotherapy, and if more clinical evidence accumulates that it actually is safer, we may begin using it more and more, particularly in more high risk cases. It is hard to be convinced that it really does improve our success rates, since our results with primary scleral buckling procedures are very good with cryotherapy.

There are a few cases in which the transscleral diode laser is the only

option. One of the study centers had a one-eyed patient with a Molteno plate in place who developed a retinal detachment with the break located beneath the Molteno implant. They treated the break with the diode laser not only transsclerally, but trans-Molteno, injected a gas bubble, and repaired the detachment. This is a useful retinopexy modality, and how widespread its ultimate use and acceptance will be remains to be seen.

Dr. Cox and Dr. Robertson have raised the issue, and Dr. Lakhanpal has touched on it too--how bad is cryotherapy? Maybe things aren't broke, so why should we be trying to fix them? It is true that our results with repair of primary retinal detachment using cryotherapy are very good--Dr. Wilkinson and coworkers, for example, have reported a 91% success rate with one operation. I think part of the reason we have so few complications with cryotherapy these days is that we have learned from experience to use it very minimally, as compared to years ago. The work of Campochiaro and others has shown the association of cryotherapy with breakdown of the blood ocular barrier, and we know that this breakdown is associated with complications such as cystoid macular edema and increase in intraocular scarring and PVR. As Dr. Cox is suggesting, it takes very large numbers in a study to demonstrate a significant improvement over a 90% success rate in a randomized fashion. Michel Bonnet has published her series in Graefe's Archives showing that there did seem to be a significant improvement when she used the transscleral diode laser as opposed to cryotherapy to treat tears greater than 180° and large tears with early PVR.

I was interested in Dr. Lakhanpal's comments on using primary vitrectomy to repair retinal detachments and avoid cryotherapy. In terms of the value of diode retinopexy in high myopes, specifically, we do not have enough high myopes in this study to compare with a control group to find whether or not we have more complications with them. There is an association between the energy level used and the amount of subretinal fluid, the endpoint in our study being a burn at the level of the retina. If we could not get a burn at the level of the retina we settled for a burn at the level of the RPE, that is a color change in the RPE and choroid. One of the reasons the energy levels used were high in this study is that these results represent the learning curve of the investigators--it took some experience on the part of the investigator to become familiar with using the probe. As you use it more and more you are better able to milk the subretinal fluid out so that there is less separation between choroid and retina. We became more experienced at looking for a burn that was clinically sufficient and we were able to use lower and lower power settings and in those cases we had fewer side effects.

In answer to Dr. Feman's point, I think that the laser does achieve a more rapid chorioretinal adhesion. Experimental evidence and histopathologic studies show that the laser adhesion is stronger than that

produced by cryotherapy. It also appears to evolve more rapidly. We certainly see early pigmentation within a few days.

Dr. Spaeth asked about how much power we used, and as I mentioned earlier, this was based on clinical judgment of the tissue effect. We tried to get a retinal burn, if not, then a burn at the level of the RPE and choroid. The hemorrhages and scleral thermal effects were indeed significantly related to the amount of energy and also significantly related to the amount of experience the investigator had.

I would like to thank Dr. Pulido for his excellent discussion. I think he has pointed out some potential uses for the diode laser, and I have tried to indicate some others as well. I believe it to be a useful addition to our surgical armamentarium. Thank you.

WILLIAM TASMAN, MD. I would first like to thank Dr. Pulido for his very thoughtful discussion. There is no question that cataract is a real threat. But I do find the incidence of 6-25%, as reported by Bradford and others, unusually high. We looked at the number of eyes that we treated with laser since 1992 using exclusively diode. There have been 270 eyes treated and only 2 have developed cataracts, both in the same patient. So our incidence is 0.74%. I think it is a more common complication with agron than diode but we have now experienced it in 1 patient where diode was used.

With regard to Dr. Spaeth's point about experience. I think if you are inexperienced and the infant is struggling, it is very easy to mistakenly hit the iris. Dr. Spaeth also raised the question of power. We start with 0.2 second duration and 200 milliwatts and then slowly raise the power incrementally until we see a reaction in the retina.

I think that Dr. Pulido's suggestion about using the transscleral diode is intriguing. I have no personal experience as yet with the transscleral diode.

Dr. Flynn is absolutely right about the myopia. It is very dynamic early. He is right, as well, about looking at the untreated eye in patients who have had laser treatments. I can tell you that in our experience the untreated eyes in laser patients see better than the treated eyes. However, I think that the reason they need treatment is because they are worse in the first place. So, it is not unexpected that the untreated eyes are functionally better. He also raised a question about nurseries in outlying communities keeping fragile babies in the hospital. In our area that often produces the same situation that you experienced in Florida where infants are sent in with more than stage 3. We have also seen situations where laser has been inadequately applied at an outlying hospital.

Finally, Dr. Elman asked whether we prefer cryo or laser and whether we tell the parents what our preference is. We did a meta-analysis a few

years ago which Dr. Flynn was involved in and it showed that the results with laser were as good as with cryo. I tell the parents my preference is for laser, but I stress the complication of cataract because it is devastating when it occurs. The reasons that I prefer the laser is that it is easier on the baby, it is easy to deliver, and you can see your applications. With cryo, gaps are more likely. Lastly, it is easier to treat posteriorly with laser.