

25-GAUGE LENS-SPARING VITRECTOMY FOR STAGE 4A RETINOPATHY OF PREMATURITY

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Purpose: To evaluate the feasibility of performing lens-sparing vitrectomies using 25-gauge instruments for the management of stage 4A retinal detachments in Retinopathy of Prematurity (ROP).

Methods: 13 eyes of 10 patients with stage 4A retinal detachments underwent a lens-sparing pars plicata vitrectomy. All patients were operated using a three port transconjunctival 25-gauge sutureless technique. The sclerotomies were made 0.5 to 1.0 mm posterior to the limbus through the pars plicata. Core vitrectomy and membrane peeling were performed. A partial fluid-air exchange was used at the end of the procedure in the majority of the cases. The anatomic status of the retina was determined by ophthalmoscopy during routine follow up visits or under general anesthesia. Per-operative complications were recorded.

Results: Eight of the infants were female and two were male. The average postmenstrual age at birth was 26.4 weeks and the average postgestational age at time of surgery was 39.3 weeks (range, 33–44). Three out of the 13 eyes (23%) had zone I ROP. With a mean follow-up of 17 months (range, 4–36) 12 out of the 13 eyes (92%) achieved successful retinal reattachment. One eye developed post operative hypotony with a small choroidal detachment that resolved spontaneously.

Conclusions: Surgical intervention with a three port 25-gauge transconjunctival sutureless vitrectomy is an effective technique to attach the retina in patients with stage 4A retinal detachment in ROP.

RETINA 28:S65–S68, 2008

Visual outcome of eyes with retinopathy of prematurity (ROP)-related retinal detachments is generally poor.^{1,2} Neither the stability of the detachment nor its progression rate is predictable after peripheral retinal ablation.³ In the past it might have been thought that if stage 4A ROP is stable, surgery should

be performed only after the macula is detached. We now know that vitreous surgery can interrupt progression of ROP from stage 4A to 4B or 5 by directly addressing transvitreal traction resulting from fibrous proliferation.⁴ Previous reports have demonstrated that lens-sparing vitrectomy in the early stages of the detachment is an effective surgical option to achieve total retinal reattachment, undistorted posterior pole, and preservation of the lens during the critical period of visual development, which in turn may lead to better functional outcomes with central fixation in these eyes.^{5–8}

With the advent of 25-gauge instrumentation, vitrectomy is evolving toward a less invasive surgical proce-

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Presented in part at The Club Jules Gonin Meeting, Cape Town, South Africa, October 2006, and at the Association of Pediatric Retinal Surgeons Meeting, St. Thomas, US Virgin Islands, January 2007.

The authors have no financial interest in the material presented.
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ture with the potential benefits of decreasing ocular trauma, surgical time, and postoperative inflammation.^{9,10} The potential benefits of combining an early intervention with a less invasive instrumentation prompted the current study. We describe our initial experience evaluating the feasibility of performing lens-sparing vitrectomy with 25-gauge instruments for the management of stage 4A retinal detachments in ROP.

Materials and Methods

A consecutive series of 13 eyes of 10 preterm infants diagnosed with stage 4A retinal detachment from ROP between April 2003 and January 2006 underwent surgical intervention. All eyes were previously treated with indirect laser for stage 3 ROP before retinal detachment developed.

The surgical technique consisted of 25-gauge transconjunctival sutureless lens-sparing vitrectomy. A three-port approach was used in all cases. The sclerotomies were made 0.5 mm to 1.0 mm posterior to the limbus through the pars plicata. First, the conjunctiva was displaced immediately above the sclerotomy site, and the transconjunctival cannula was inserted into the vitreous cavity using a beveled trocar. This procedure was used to place cannulas in the inferotemporal, superotemporal, and superonasal quadrants (Fig. 1). A 25-gauge infusion cannula was placed in the inferotemporal quadrant, while the superotemporal and superonasal ports were used to pass the light pipe and the cutter, respectively (Accurus surgical systems: Baush & Lomb, St. Louis, MO; Millennium and ALCON, Fort Worth, TX). Vitrectomy and membrane peeling were performed with settings of 1,200 cpm to 1,500 cpm and 400- to 500-mmHg suction. The aim of vitrectomy was to

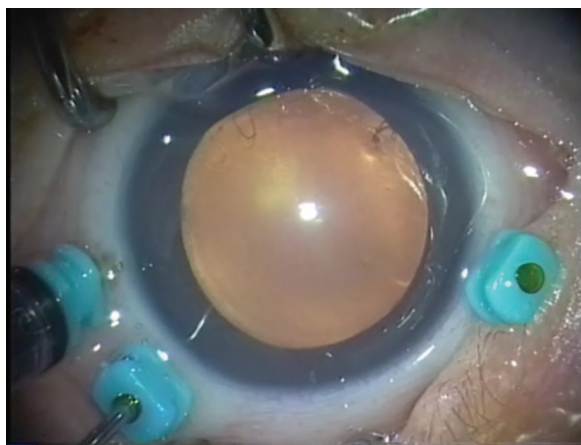


Fig. 1. Twenty-five-gauge ports for the infusion, light pipe, and cutter were placed in the inferotemporal, superotemporal, and superonasal quadrants, respectively.

dissect the tractional proliferation between the ridge and the lens, the ridge and the nerve, the ridge and the vitreous base, and the circumferential traction along the ridge. Partial fluid–air exchange was used at the end of the procedure in most cases. When fluid was left in the vitreous cavity, the infusion cannula was removed at the last step to check for the need of further infusion. The conjunctiva was closed using bipolar diathermy in all cases.

The clinical charts were retrospectively reviewed to collect the following data: date of birth, birth weight, gestational age at birth, sex, clinical characteristics of ROP before laser ablation, preoperative anatomical status of the retina, date of surgery, peroperative complications, date of last follow-up visit, and anatomical status at last follow-up visit. A favorable result was considered when complete reattachment of the retina was obtained. The anatomical status was determined by ophthalmoscopy during follow-up visits or with general anesthesia.

Results

The cohort of 10 patients was composed of 8 females and 2 males. The average birth weight was 1,133 g, and the average gestational age was 26.4 weeks. Before laser ablation, 3 eyes (23%) had zone I ROP, and 10 (77%) had zone II ROP. Vitreous surgery was performed at a mean gestational age of 39.3 weeks (range, 33–44 weeks). With an average follow-up of 17 months (range, 4–36 months), 12 (92%) of 13 eyes achieved a favorable result with complete retinal reattachment. No intraoperative complications were noted. None of the patients developed cataract or endophthalmitis. One eye developed a small choroidal detachment postoperatively that resolved spontaneously.

Discussion

ROP represents a great proportion of childhood blindness in the world; in fact, it is the leading cause in some countries.¹¹ Despite our better understanding of the disease, the recognition of atypical clinical features, and the introduction of the Early Treatment for Retinopathy of Prematurity Randomized Trial for more timely intervention with laser ablation of the avascular retina, retinal detachment continues to occur in some patients.^{12–16} Visual outcome of eyes with ROP-related retinal detachments is generally poor.^{1,2} ROP-related detachment tends to progress, and the potential for good vision decreases as the detachment and its duration increase.

Misconceptions in ROP for sometime were that stage 4A ROP might be stable and that surgery should be performed only after the macula was detached. Due

to the increasing literature supporting surgical intervention in the early stages over the past few years, we now know not only that vitreous surgery can interrupt progression of ROP from stage 4 to 5 but also that lens-sparing vitrectomy in the early stages of the detachment is associated with the best chances of total retinal reattachment and of better functional outcomes for these eyes.^{4–8} Thus, when laser or cryotherapy fails and retinal detachment develops, other therapeutic options should be strongly considered. At present, retinal reattachment can be achieved in many of these cases using modern vitreoretinal techniques, including 25-gauge lens-sparing vitrectomy.¹³

The results of the current series are similar to previous findings of surgical series of lens-sparing vitrectomy for stage 4A ROP.^{5–8} These series used 20-gauge instrumentation. The use of 25-gauge vitrectomy has been described to be suitable for different clinical situations.^{17,18} Both the feasibility and the potential benefits of this technique for the smaller eye of a premature infant deserve special attention. Therefore, we used 25-gauge vitrectomy in the management of the early stages of retinal detachment in infants with ROP. On 13 eyes of 10 patients with stage 4A ROP, a 25-gauge transconjunctival sutureless lens-sparing vitrectomy technique was used. In 12 (92%) of 13 eyes, total reattachment of the retina was obtained.

There are potential disadvantages of using a 25-gauge transconjunctival sutureless approach. First, the flexibility of the instruments and the limited availability of surgical tools are challenging. We found that with the 25-gauge cutter, we could release enough transvitreal traction to allow for complete reattachment of the retina in most cases. This might not be the case in more advanced stages of the disease. Second, endophthalmitis after 25-gauge vitrectomy has been described and should be a concern for every surgeon.¹⁹ This was a small series, and we did not encounter this problem. In addition, postoperative hypotony could be a disadvantage of this technique. Accurate intraocular pressure control is difficult after surgery for these babies. In our series, one eye developed a small choroidal detachment postoperatively that resolved spontaneously. Closure of the conjunctiva with bipolar diathermy might be adequate to decrease the chances of both endophthalmitis and postoperative hypotony.

No intraoperative complications were noted in this series. We used a three-port approach to avoid intraoperative hypotony. All three cannulas could be adequately located in the limited surgical space. Neither the lens nor any other intraocular structure was damaged when placing these ports.

Some limitations of this study include the fact that it was a retrospective, noncomparative series, small sample size, and relatively short-term follow-up. Nonetheless, data from the current series showed that surgical intervention with three-port 25-gauge transconjunctival sutureless lens-sparing vitrectomy may be considered an effective option to attach the retina in some cases of stage 4A retinal detachment in ROP.

Key words: 25-gauge vitrectomy, transconjunctival sutureless vitrectomy, retinopathy of prematurity.

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