

Discussion

Limited data is currently available regarding outcomes and prognostic factors of combined TKpro/PPV/PKP with relatively small sample sizes. Table 5 summarizes the previous literature regarding outcomes of this combined procedure. The current study of 55 eyes is a larger sample size than many of the previous studies. The current study also had a relatively longer mean follow up in comparison with previous studies. The current study had an average follow up of 16 months and 13% of eyes with follow up ≥ 4 years at final examination.

Previous studies have reported a wide range in visual outcomes. For instance, previous studies have reported a rate of improvement in VA at last exam from preoperatively ranging from 40%-84% of eyes [17]. The current study reports that 32.7% of eyes had improvement in VA at last examination from preoperative. One possibility for this discrepancy is that the current study included all indications for the combined procedure, including severe infections and trauma. The current study was also performed at a large, tertiary referral center. 46 out of 55 eyes (83.6%) had a history of prior ocular surgery.

In the current study, there was no significant variation in visual outcomes with regard to indication of surgery. There was no significant difference in visual outcomes between infectious and non-infectious cases. There was also no significant difference in rates of improvement in VA postoperatively between eyes with a retinal detachment and those without retinal detachment. This supports the notion that the combined procedure can be used for a variety of indications. There were some trends in visual outcomes by indication. Eyes without a history of trauma trended towards having higher rates of improvement in VA at last exam from preoperative although this was not statistically significant ($p=0.13$). The indication for PPV of GDI repositioning trended towards an association with improvement in VA ($p=0.07$). The PPV was performed solely for GDI positioning into the pars plana in 5 of 8 eyes where a GDI was placed into the pars plana. 3 of the 8 eyes also had co-existing retinal pathology for which the PPV was indicated: 1 retinal detachment, 1 vitreous prolapse into the anterior chamber and 1 epiretinal membrane. The majority of these 8 eyes have a much better preoperative visual prognosis and have better visual potential with less retinal pathology in comparison with other eyes that required PPV for vitreoretinal diseases such as endophthalmitis. Although the majority of eyes did not show an improvement in VA at last examination from preoperative, a significant percentage of eyes did have functional vision at last exam. 25% of eyes had a VA at last exam of at least 20/200. Previous studies have reported a final outcome of phthisis bulbi ranging from 13% to 22% of eyes and VA of NLP ranging from 4%-15%. In the current study, phthisis bulbi was noted 3.6% of eyes and 9% of eyes had a VA of NLP at last examination. These outcomes are important

in preoperative counselling of patients undergoing this combined procedure. In the current study, almost 10% of eyes had VA of NLP at last exam. In some cases, the combined TKPro/PPV/PKP may serve the role of a globe salvage procedure rather than visual rehabilitation. Setting realistic expectations for the patient preoperatively is paramount [18].

Previous studies report a rate of graft failure postoperatively ranging from 21%-80%. In the current study, corneal grafts remained clear at final examination in 58.2% of eyes. There was no significant difference in rate of corneal graft clarity at last exam between eyes with an indication related to trauma and those without a history of trauma; however, infectious related cases were less likely to have a clear cornea at last examination than non-infectious cases ($p=0.0019$).

Retina outcomes in the current study were also similar to what has been previously reported in the literature. Previous studies have reported a rate of retinal reattachment from 84% to 94%. The current study reports a rate of retinal reattachment intraoperatively of 83%.

Both the current study and the previous literature support that TKpro/PPV/PKP is associated with relatively low intraoperative complication rates, which are similar to that of other complex eye surgeries. The rate of postoperative complications in the current study was comparable to the rates of complication of endoscopic assisted vitrectomy reported by Ayyildiz, et al. Suprachoroidal hemorrhage was noted in 1 eye postoperatively in the current study. We report a rate of postoperative retinal detachment after the combined procedure to be approximately 10%. Previous studies in the literature have reported a rate of retinal detachment postoperatively ranging from 10% to 38%. The authors conclude that the combined TKpro/PPV/PKP is a relatively safe procedure with complication rates similar to other complex eye surgeries.

Few studies have reported statistically significant prognostic factors associated with outcomes of combined TKpro/PPV/PKP. In the current study, prior graft failure as an indication for surgery was associated with lack of improvement in VA at last exam from preoperative, which was statistically significant ($OR=0.16$, $p=0.0027$). In the current study, preoperative VA of LP was associated with poor visual outcomes which was statistically significant ($p=0.0219$). This finding is likely due to the fact that patients with worse preoperative VA are more likely to have a more advanced disease state. In the current study length of surgery greater than 2 hours was associated with improvement in VA at last exam from preoperative ($p=0.0065$). One possible contributing factor for this finding is that all surgeries involving GDI repositioning were greater than 2 hours. Another possible explanation is that some of the retinal detachments were deemed inoperable during the surgery which may have led to shorter surgery times.

A variety of ocular pathology and indications for surgery were included in the current study. This is likely contributing to the fact that many of the factors assessed did not show statistically significant association with outcomes. This study is also limited by being performed at a single tertiary referral center with many different surgeons, including surgeons in training performing minor steps of the surgery. Although this sample size of 55 eyes is larger than many of the previous studies, it is still a relatively small sample size. Another limitation is that the VA was not measured in a uniform, standardized fashion. Lastly, the variation in follow up is a limitation of this study. The current study had a relatively longer mean follow up time in comparison with previous studies that investigated outcomes at 6 months and 1 year postoperatively; however, two eyes included in this study had less than one month of follow up at final visit.

Conclusion

In summary, combined TKPro/PPV/PKP can be performed in patients with corneal opacification while allowing for bimanual vitreoretinal surgery. In the current study, preoperative VA of LP was associated with poor visual outcomes. Visual outcomes were similar between infectious and non-infectious cases although corneal graft clarity at last exam was lower in the infectious group. Visual outcomes and corneal graft clarity were similar between traumatic and non-traumatic cases. Combined TKpro/PPV/PKP can be performed for a variety of indications and is associated with relatively low rates of complications in the current study.

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