Laser Peripheral Iridotomy for Primary Angle Closure

How strong is the evidence?

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One of the procedures most frequently performed by glaucoma specialists and comprehensive ophthalmologists is the prophylactic laser peripheral iridotomy (LPI). To the asymptomatic and unsuspecting patient, the diagnosis of anatomically narrow angles and the suggestion of prophylactic LPI can be alarming, which is why the recommendation of LPI is a common reason for a second opinion. Each ophthalmologist has his or her own method of making this diagnosis, but it usually entails a slit-lamp examination and gonioscopy and occasionally involves anterior segment optical coherence tomography or ultrasound biomicroscopy. Based on the presence and extent of iridotrabecular apposition, a recommendation of LPI or observation may be made.[1] The standard threshold for diagnosing the occludable angle and prompting a recommendation of iridotomy is the finding of 180° of iridotrabecular apposition on gonioscopy, with darkroom gonioscopy providing a more sensitive examination.

From the patient's perspective, the diagnosis of narrow angles is startling, and treatment is generally assumed to be more invasive than it actually is. In general, LPI is felt to be a safe procedure with low morbidity, but some patients report glare following the procedure.[2] At least one study has suggested a relationship between LPI and an increased rate of cataract development,[3] and investigators in Japan recently described an association between argon laser iridotomy and bullous keratopathy (although the study design left open the possibility that the keratopathy could have been caused by the underlying disease state or the laser technique).[4] A dedicated physician will take the time to address the patient's concerns and explain the risks and benefits of the procedure.

However, the reality is that, although LPI is the standard of care and all ophthalmologists are required to perform it as part of residency training, there is not much high-quality evidence that this procedure benefits patients in the long term. The data for iridotomy in primary angle closure are based largely on historic case series attesting to its benefit in acute angle closure[5] and on uncontrolled studies that document decreased iridotrabecular contact and IOP after the procedure.[6] Prospective evidence demonstrating a reduced risk of primary angle-closure glaucoma (PACG) among patients with narrow angles undergoing LPI is minimal. Moreover, there are no clear data that LPI improves quality of life among patients who undergo this treatment.

IDENTIFYING CANDIDATES

Several core assumptions are inherent to a useful prophylactic procedure. First, one ought to be able to identify the patients most likely to benefit from the intervention. Second, the procedure must be effective. Third, on a population level, the risk incurred by undergoing the procedure should be outweighed by its overall benefit (both for the eye and with regard to quality of life). Along those lines, one might also consider the cost-effectiveness of the procedure. Notwithstanding the procedure's frequent use in treating anatomically narrow angles, it is unclear whether LPI meets any of the aforementioned assumptions of a satisfactory prophylactic intervention.

Determining the patients most likely to benefit from LPI is challenging, because it is not clear that iridotrabecular apposition resolves in all patients after the procedure. Ramani et al found that 28% of subjects classified as PACG suspects progressed to PACG within 2 years of undergoing LPI.[7] Likewise, he and colleagues conducted a prospective study in which ultrasound biomicroscopy was used to quantify the angle opening distance in eyes with narrow angles 2 weeks after undergoing LPI.[8] They

found that, in 59% of eyes with a patent iridotomy, iridotrabecular apposition persisted in at least three quadrants. As expected, eyes with the narrowest angles and thickest irides at baseline were the least likely to experience a full resolution of apposition after LPI. It is not clear whether the relative risk of acute or chronic angle closure is reduced in these patients despite persistent iridotrabecular apposition. Accordingly, no evidence points to who is likely to derive the greatest benefit from LPI—those with the narrowest angles and thickest irides in whom apposition persists but is decreased or those with less apposition at baseline whose angles appear fully open after LPI?

THE CLINICAL IMPACT

Little research has been done to determine the clinical impact of prophylactic LPI on patients with angle closure. In fact, a 2008 Cochrane meta-analysis concluded that there is no strong evidence for the use of LPI in treating angle closure due to the complete absence of any randomized controlled trials to assess its efficacy.[9] However, in one 5-year prospective observational study in southern India, 28 patients with angle closure and no signs of glaucoma were advised to undergo LPI. Of the nine patients who underwent the procedure, only one developed PACG, whereas seven of the 19 who refused LPI developed glaucoma over the study's 5-year follow-up. The study's authors were unable to determine any factors that significantly predicted progression to PACG.[10]

More recently, a randomized controlled trial was conducted to address this topic. Among a population with a relatively high incidence of PACG in Mongolia, Yip et al randomized 4,597 individuals to a control, no-screening arm or to anterior chamber depth screening by ultrasound A-scan.[11] In the screening arm, 685 individuals had shallow anterior chambers and underwent an examination with gonioscopy. Of these individuals, 160 were found to have angle closure on gonioscopy, and 156 were treated with prophylactic LPI. After 6 years of follow-up, the investigators found no significant difference in the rate of PACG between the screened (1.81%) and control (1.40%) groups. Of note, there was considerable loss to follow-up in this study. Also, this was a trial of population screening for narrow angles in a high-risk population. These data may or may not be representative of the relative risk of PACG among treated and untreated patients with a diagnosis of anatomically narrow angles who are referred to a glaucoma specialist.

Another trial is underway in southern China.[12] Subjects with bilateral angle closure will receive LPI in one eye, while the fellow eye will be left untreated. After a minimum 3-year follow-up, the investigators will determine whether LPI is safe and effective at preventing the signs and symptoms of PACG. The study will provide data on the natural history of the fellow untreated eye. Because of the careful design and fellow eye control in this important study, it may prove valuable in determining the role of LPI in a cohort of patients known to have angle closure and to be at risk for its sequelae. As is frequently the case with randomized controlled trials, the duration of the trial is likely to be shorter than the period during which patients may benefit from the intervention.

CONCLUSION

Despite a lack of evidence supporting its use, prophylactic LPI has long been, and remains, the standard of care for the treatment of narrow angles, even in eyes with no signs of glaucomatous changes and that have never experienced an acute attack. It is only in very recent years that trials have begun to test the clinical benefit of LPI[11,12] and exciting new insights have been proposed regarding the pathogenesis of PACG.[1] Because many patients with anatomically narrow angles will never go on to develop signs or symptoms of glaucoma, future investigations should attempt to identify those patients with angle closure most likely to benefit from LPI. ❑

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