Case Report

Penetrating Keratoplasty after Excimer Laser Surgery

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Abstract : **We present six patients who were referred after undergoing excimer laser surgery and subsequently required penetrating keratoplasty (PKP) to correct complications of the initial surgery. The excimer laser procedures included 5 cases of astigmatism and 1 case of hyperopic correction. All cases had complications which decreased visual function and could not be corrected by non-surgical methods. Five cases had severe corneal haze and one case had an acute perforation following excimer laser surgery. After PKP, all patients had best-corrected visual acuity (BCVA) which varied from 20/30 to 20/20. Awareness of potential complications, which need PKP after excimer laser surgery, is necessary.**

Key words : Penetrating Keratoplasty, Excimer Laser Surgery, Cornea

เรื่องย่อ : **การผ่าตัดเปลี่ยนกระจกตาที่เนื่องมาจากการแก้ไขสายตาผิดปกติด้วยแสงเลเซอร์**

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สารศิริราช 2545; 54: 354-357.

การศึกษานี้เป็นการรายงานผลผู้ป่วย 6 ราย ที่ได้รับการผ่าตัดเปลี่ยนกระจกตา เนื่องมาจากเกิดภาวะแทรกซ้อนภายหลังการแก้ไขสายตาด้วยแสงเลเซอร์ ทำให้ความสามารถในการมองเห็นลดลง และไม่สามารถแก้ไขด้วยวิธีอื่น ภาวะแทรกซ้อนดังกล่าวประกอบด้วย กระจกตาทะลุ 1 ราย และแผลเป็นที่กระจกตา 5 ราย ทุกรายได้รับการทำผ่าตัดเปลี่ยนกระจกตาเป็นผลสำเร็จ และมีความสามารถในการมองเห็นที่ดีที่สุดกลับมาที่ระดับ 20/30 ถึง 20/20

คำสำคัญ : การผ่าตัดเปลี่ยนกระจกตา, การแก้ไขสายตาผิดปกติด้วยแสงเลเซอร์

INTRODUCTION

Excimer laser surgery appears to be an effective and safe method for correcting refractive errors and corneal irregularity.[1-5] There are some significant side effects and complications that can occur with this procedure. Fortunately, most of them are benign. Several reports have been published concerning the side effects and complications of this procedure.[5-8]

We report six cases who were referred to Eye Care Center, University of British Columbia, Vancouver, Canada. All the patients had complications related to the procedure, which subsequently required PKP to correct visual function. Pre-operative information of the prior surgery in some cases is unable to obtain due to lack of co-operation from the other clinic.

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CASE REPORT

Case 1

A 53-year-old male had uneventful hyperopic photorefractive keratectomy (PRK) for a refraction of +5.50 –4.25 x 170'. Three months after the surgery, the patient's refractive error worsened to +5.00 –3.00 x 170'. An enhancement procedure was done with over-setting of the treatment to compensate for the magnitude of regression. The day after the second operation, the patient presented with decreased vision. On examination, the anterior chamber was flat with leakage of aqueous humor from the anterior chamber at the inferior area of the cornea. The patient was referred to the clinic. Tissue adhesive was applied to stop the leakage and penetrating keratoplasty was performed subsequently. Three months after the surgery, the best-corrected visual acuity (BCVA) with -1.25 D was 20/20.

Case 2

A 32 year-old female with advanced keratoconus underwent penetrating keratoplasty in the right eye. Five months after the operation, the sutures broke down which induced astigmatism of –2.00 – 7.00 D x 75'. The patient underwent excimer laser surgery (photo astigmatic refractive keratectomy, PARK) to reduce astigmatism. The refraction improved to +0.50 –2.00 D x 75'. During the following year, the patient developed a 2+ circinate haze and her astigmatism increased to –0.75 – 4.00 D x 55'. She underwent repeat PARK 18 months after the first procedure. There was no improvement in her astigmatism and the haze increased to 4+ within the next 3 months. She also developed cataract in that eye. The patient was then referred to the clinic. Penetrating keratoplasty with cataract extraction and intraocular lens implantation was performed in the right eye. The BCVA with –1.25 D was restored to 20/25 by 10 months after the last surgery.

Case 3

A 38-year-old female with history of keratoconus underwent penetrating keratoplasty in the right eye. One year after the operation, the refraction was –1.00 –8.25 x 60'. Excimer laser surgery (PARK) was performed for astigmatism correction. The patient developed a 2+ circinate haze with regression to +0.50 –4.00 x 78'. The patient had 2 further repeat excimer laser surgery episodes at 6 and 12 months after the first procedure. The patient was lost to follow up for 2 years because she became pregnant and return with a refraction of –3.50 –6.00 x 50' and severe haze. The patient was then referred to the clinic. Penetrating keratoplasty was performed and the BCVA with -0.75 D was restored to 20/30 by 6 months after the final surgery.

Case 4

A 31-year-old male with a refraction of +2.50 –4.00 x 110' underwent excimer laser surgery (PARK) to correct astigmatism. Postoperative refraction was +0.50 -0.75 x 90' at 3 months. One year later, the patient developed severe deep haze with regression to +1.25 –6.50 x 122'. The patient was referred to the clinic and underwent penetrating keratoplasty. His BCVA with –2.00 D was restored to 20/30 by 1 year after the procedure.

Case 5

A 42-year-old male, with a history of peripheral corneal degeneration with induced astigmatism of plano –5.00 x 10' underwent excimer laser surgery (PARK) for astigmatism correction in the right eye. The patient developed severe haze with regression to +2.50 – 5.50 x 180' (BCVA = 20/200). He also developed cataract in that eye. The patient was referred to the clinic and underwent penetrating keratoplasty and cataract extraction with intraocular lens implantation. The BCVA with –2.50 –0.75 x 55' was restored to 20/30 by 1 year after the procedure.

Case 6

A 45-year-old female with history of keratoconus underwent excimer surgery (phototherapeutic keratectomy, PTK) to produce flattening of the keratoconic area. The patient developed severe apical scarring with decreased vision to counting fingers. The patient was referred to the clinic and had penetrating keratoplasty. The BCVA with –2.00 –1.00 x 35' was restored to 20/20 by 6 months after the procedure.

DISCUSSION

Excimer laser surgery has been used extensively worldwide. However, as in all ophthalmic surgeries, complications and side effect can occur. Significant complications and side effects are rare and do not usually threaten visual acuity. Among them are under-correction, over-correction, progressive regression, irregular astigmatism and severe corneal haze which decreased the best-corrected visual acuity.[5-9] Most of the complications can be corrected by laser enhancement or contact lenses. Very few reports have been published concerning penetrating keratoplasty in the management of complication of excimer laser surgery.[8,11-14]

In this report, the patients had excimer laser surgery for treatment of hyperopia and astigmatism. All cases developed complications subsequently requiring penetrating keratoplasty. The most of frequent complication found was a circinate haze. Severe haze is sometimes called a scar. There are several reports on scarring of the cornea after excimer laser surgery.[10-13] No study had demonstrated the reason for severe haze in these particular cases. We believe that in unhealthy cornea such as pre-existing corneal surgery, degeneration or keratoconus, the risk for developing haze is high. Although some previous reports demonstrated the laser treatment in these particular cases[10,15], we believe the success rate is still very low. Careful preoperative ocular examination should be done to decrease adverse results.

In this report, one case had acute perforation due to over setting of the laser treatment to compensate the expected regression. The over treatment caused the cornea to become extremely thinned and it eventually perforated. We were unable to obtain the corneal thickness of the patient before the first surgery from the other clinic due to the lack of co-operation. Calculation of the amount of tissue to be removed and the remaining corneal thickness before the procedure is necessary to prevent this situation. To our knowledge, this is the first report of an acute perforation caused by excimer laser.

We suggest that all patients undergoing excimer laser surgery should be warned of the possibility of rare complication such as perforation and severe haze that may require corneal transplantation.

ACKNOWLEDGEMENT

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REFERENCES

1. Dausch D, Smecker Z, Klein R, et al. Excimer laser photorefractive keratectomy for hyperopia. J Cataract Refract Surg 1997; **23:** 169-76.
2. Payvar S, Hashemi H. Laser in situ keratomileusis for myopic astigmatism with the Nidek EC-5000 laser. J Refract Surg 2002; **18:** 225-33.
3. Merchea M, Pieger S, Bains HS. Comparison of laser in situ keratomileusis outcomes with the Nidek EC-5000 and Meditec Mel 70 excimer lasers. J Refract Surg 2002; **18:** S343-46.
4. Comaish IF, Domniz YY, Lawless MA, et al. Laser in situ keratomileusis for residual myopia after photorefractive keratectomy. J Cataract Refract Surg 2002; **28:** 775-81.
5. Sugar A, Rapuano CJ, Culbertson WW, et al. Laser in situ keratomileusis for myopia and astigmatism: safety and efficacy: a report by the American Academy of Ophthalmology. Ophthalmology 2002; **109:** 175-87.
6. Maguen E, Salz JJ, Nesburn AB, et al. Results of excimer laser photorefractive keratectomy for correction of myopia. Ophthalmology 1994; **101:** 1548-56.
7. Seiler T, Holschbach A, Derse M, et al. Complications of myopic photorefractive keratectomy with excimer laser. Ophthalmology 1994; **101:** 153-60.
8. Holland SP, Srivannaboon S, Reinstein DZ. Avoiding serious corneal complications of laser assisted in situ keratomileusis and photorefractive keratectomy. Ophthalmology 2000; **107:** 640-52.
9. Stulting RD, Carr JD, Thompson KP, et al. Complications of laser in situ keratomileusis for the correction of myopia. Ophthalmology 1999; **106:** 13-20.
10. Tunnanch T, Ruusavaara P, Uusitila R, et al. Photoastigmatic keratectomy for correction of astigmatism in corneal graft. Cornea 1997; **16:** 43-53.

11. Alaa M, Waring G, Malaty A, et al. Increased corneal scarring after phototherapeutic keratectomy in Fuchs' corneal dystrophy. J Refract Surg 1997; **13:** 308-10.
12. Chan W, Hunt K, Glasgow B, et al. Corneal scarring after photorefractive keratectomy in penetrating keratoplasty. Am J Ophthalmol 1996; **121:** 570-71.
13. Meyer J, Stulting R, Thompson K, et al. Late onset of corneal scar after excimer laser photorefractive keratectomy. Am J Ophthal 1996; **121:** 529-33.
14. Drew AF, Schiman HL, Kombrinck KW, et al. Persistent corneal haze after excimer laser photokeratectomy in plasminogen-deficient mice. Invest Ophthalmol Vis Sci 2000; **41:** 67-72.
15. Ward M, Artunduaga G, Thompson K, et al. Phototherapeutic keratectomy for the treatment of nodular subepithelial corneal scars in patients with keratoconus who are contact lens intolerance. CLAO 1995; **21:**130-32.