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Review

Refractive issues in pregnancy

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Abstract

Pregnancy is known to cause refractive changes as a result of various hormonal changes occurring during pregnancy. These changes may persist for a few weeks post-partum and during lactation. In this article we discuss various refractive issues in pregnancy that have an effect on contact lens use, myopia and the outcome of refractive surgery.

Key words: contact lens, eye, myopia, pregnancy, refractive surgery.

Introduction

Visual changes are common during pregnancy and many are specifically associated with pregnancy itself. Hormones produced during pregnancy and lactation can cause most women's refractive state to fluctuate dramatically. In general, unless the refractive change is quite significant, ophthalmologists usually recommend waiting until a few weeks post-partum before eyewear is re-evaluated.

Refractive surgery is a general term that refers to any surgery that changes the shape of the cornea or the way the eye focuses light internally. The goal of refractive surgery is to reduce or eliminate nearsightedness (myopia), distorted vision (astigmatism) or farsightedness (hyperopia or hypermetropia) and to lessen a person's dependence on eyeglasses and contact lenses.

It may be quite tempting for women with a refractive error to consider refractive surgery in this era. It is important for clinicians to have up-to-date knowledge about the refractive changes in the eye during pregnancy as these may have implications in the management.

Method of literature search

A Medline search covering the years 1966 to 2005 was performed using the words pregnancy and eye, refractive eye surgery, photorefractive keratectomy (PRK), laser-assisted *in situ* keratomileusis (LASIK) and contact lens. Additional references were obtained from the bibliographies of articles obtained in the Medline search. Relevant articles including original articles, review papers, case studies and relevant book chapters were reviewed.

Physiological changes in the cornea and lens

Corneal sensitivity is found to be decreased in most pregnant women, although one study found no change in corneal sensitivity.[1–3] The sensitivity returns to normal by 2 months post-partum. This change in corneal sensitivity does not appear to be related to the duration of gestation, weight gain during pregnancy or mean arterial pressure at the time of examination.[1,2]

Corneal thickness has been found to increase during pregnancy,[1,4,5] which resolves a short time after delivery. The amount of increase in thickness varies from 1 to 16 microns.[4] A possible cause of increased corneal thickness is fluid retention related to pregnancy.

The corneal curvature is also found to increase by an average of 1 dioptre in the second half of pregnancy, resolving post-partum or after cessation of breastfeeding.[3] The curvature of the crystalline lens increases which causes a transient loss of accommodation during pregnancy and breastfeeding.[6]

Refractive issues

Refractive changes and pregnancy

There is no definitive consensus in the published literature on the refractive changes in pregnancy, although proven

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physiological changes suggest that refractive changes do occur in pregnancy.

Some authors[3,7,8] have found that mean visual acuity, corneal curvature and refractive error did not change significantly during pregnancy. However, in a prospective trial[3] 25% of women developed contact lens intolerance during the study period, and in a large survey, authors found that changes in visual acuity and refractive error occurred in 14% of women during pregnancy.[9] Unstable refractions are thought to be related to changes in the corneal thickness and curvature.

Myopia and pregnancy

Myopia (shortsightedness) is a very common ocular problem, affecting perhaps one billion people worldwide. Myopia is classified as mild or low (< 2 dioptre), moderate or intermediate (2–6 dioptre) and severe or high (> 6 dioptre). Myopia may increase during pregnancy. In a survey, Pizzarello[9] studied 83 pregnant women to determine the causes of vision change during pregnancy and post-partum. The women who complained of visual changes were found to have experienced a myopic shift during pregnancy, which returned to pre-pregnancy levels in the post-partum period.

Myopia and the effect of labour

No cases have been reported in the literature that can connect retinal detachment and childbirth in myopic women. Neri *et al.*[10] undertook a study to test whether this assumption was true. They collected obstetric data from 50 women with myopia from 4.5 to 15 dioptres who were admitted to the labour ward. Fundus examination was performed in all of them before and after delivery. Various types of retinal degeneration and retinal breaks were observed in most of them at their arrival but none had a retinal tear or detachment associated with labour and delivery. The authors concluded that high myopic patients should be allowed to deliver spontaneously.

However, a later study has shown an increasing trend of Caesarean section in high myopic patients. Loncarek *et al.*[11] looked at 30 553 deliveries during a 9-year period from 1993 to 2002. Out of this group 87% had spontaneous deliveries, 3% had vacuum extractions and 10% had Caesarean sections. Of the total number of 693 deliveries of myopic women during the study period, there were 421 (61%) deliveries of women with low myopia, 159 (23%) deliveries of women with intermediary myopia and 113 (16%) deliveries of women with high myopia. The reported rates of Caesarean section were similar in the non-myopic, low-myopic and intermediary myopic groups, and notably higher in the high myopic group. The rates of vacuum extraction were notably higher in intermediary myopic and high myopic group than in low myopic and non-myopic group. Among all, high myopics had the highest rates of operative deliveries, having only 43% of spontaneous delivery.

On balance, a spontaneous vaginal delivery is not considered a contraindication in patients with high myopia.

Contact lens intolerance

Many women develop contact lens intolerance when pregnant. This is unlikely to be due to a corneal sensitivity, as corneal sensitivity decreases in pregnancy. Changes in corneal thickness and curvature may be the main factors in the development of contact lens intolerance in pregnancy,[1,12,13] but there is no evidence to suggest what degree of change in corneal thickness and curvature leads to contact lens intolerance. A decrease in tear production is also noted during the third trimester of pregnancy in approximately 80% of pregnant women studied.[12] This might be another contributing factor for contact lens intolerance as it can cause dryness of the conjunctiva. Other changes, such as conjunctival modification and lid oedema, may also cause discomfort with contact lens wear.[12]

Twenty-five per cent to 30% of female contact lens wearers begin to have problems with previously comfortable contact lenses during pregnancy.[3,12] It is surprising that a woman may have contact lens intolerance during one pregnancy but not during another.[3] If possible, it is preferable to avoid prescribing new contact lenses for correction until several weeks post-partum.

Refractive eye surgery and pregnancy

Laser refractive surgery is gaining popularity as a method of corrective treatment for refractive errors. Excimer laser refractive surgery is extremely popular and has been found to be both efficacious and safe for the treatment of low to moderate myopia (6.00 dioptres). Excimer laser is a UV laser controlled by a computer; the amount of ablation is determined by algorithm. There is considerable ongoing debate as to the optimum method to apply the laser, that is, PRK, LASIK or LASEK. It has been approved for use in a procedure called photorefractive keratectomy (PRK) and, as of November 1998, for a procedure called LASIK.

PRK gently reshapes the cornea by removing microscopic amounts of tissue from the outer surface with an ultraviolet laser controlled by a computer. The procedure itself takes only a few minutes, and patients are typically back to daily routines in 1 to 3 days. Risks of PRK include postoperative pain, myopic regression, a comparatively long visual recovery period and stromal opacity (haze). LASIK is a more complex procedure than PRK. It is performed for all degrees of myopia. The surgeon uses a knife called a microkeratome to cut a flap of corneal tissue, removes the targeted tissue beneath it with the laser, and then replaces the flap. LASIK is the more favoured procedure of the two and is considered a suitable procedure for correcting the most severe refractive errors. The popularity of LASIK may be attributed to the relatively fast visual recovery time and the relative comfort in immediate postoperative period, and minimal incidence of haze.

Risks of LASIK surgery are dry eye, undercorrection and overcorrection, flap complications (e.g. damage to the flap or loss of the flap), diffuse lamellar keratitis, posterior ectasia and epithelial ingrowth. LASIK flap resulted in both an increase in the spherical aberration and a wavefront variance.

The LASIK results obtained with the femtosecond laser give more predictable flap thickness and better astigmatic neutrality and are gaining popularity.

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Recent reviews have highlighted the advantage of the use of laser subepithelial keratectomy (LASEK) over LASIK. LASEK offers an excellent profile in terms of both final outcome (uncorrected visual acuity) and safety (best corrected visual acuity). Untoward effects of LASEK are readily prevented/treated with a variety of agents. Careful patient selection and counselling are vitally important, and all patients must be fully informed of possible side-effects.

Postoperative pain can be ameliorated using topical and oral analgesia. Infection can be most effectively addressed with the fourth generation of fluoroquinolones. Topical ophthalmic drugs pose little risk to the mother and to the developing fetus. Despite this, caution should be exercised when prescribing any ocular medication to pregnant women, especially drugs that are known to be dangerous when taken systemically. Quinolone, gentamicin and erythromycin are very important ophthalmic antibiotics used routinely. There is no conclusive evidence to prove that the use of these drugs contributes to an elevated rate of congenital abnormality or fetal death. As with any medication, it is important to weigh the risk versus benefit in using the drug.

The timing of refractive eye surgery for a patient intending to become pregnant can be a difficult decision. Hefetz *et al.*[14] reported that pregnancy and labour probably had no effect on refractive results after PRK. The authors reported stable refractions in six of the eight pregnant women who underwent PRK, although myopic regression occurred in the other two patients. In one study, Sharif[15] evaluated refractive corneal changes that occurred in women who became pregnant after undergoing laser PRK for the treatment of myopia. He studied the refractive corrections in nine women (18 eyes) during the follow-up period. All women were followed up for at least 12 months after PRK. Twelve of 18 eyes (66%) had myopic regression during the follow-up period. Three women (six eyes) who had stable refractions after PRK became pregnant at least 5 months postoperatively. The corneal haze and myopic regression improved in 50% of the eyes after delivery. The author concluded that pregnancy after PRK had a better effect on refractive results of surgery by promoting corneal wound healing. Starr[16] reported a case of overcorrection in a patient who became pregnant shortly after PRK, followed by spontaneous abortion and complete reversal of the overcorrection. If refraction measurements are taken to determine the amount of surgical correction during this fluctuation, a false reading may occur and surgical correction would be inappropriate. Because of the documented changes in corneal curvature during pregnancy, current recommendations are that women must not be pregnant and should avoid pregnancy for 1 year after surgery. The refractive surgery should be delayed until refraction is stable in the post-partum period.[17,18]

Conclusion

Changes in vision and refraction occur during pregnancy. Changing spectacles a few times can be an expensive option. Contact lens intolerance is also common during pregnancy and it may be wise to avoid prescribing new contact lenses until several weeks after delivery. Both of these options are, however, very safe and are elective and do not cause irreversible changes.

The results of refractive eye surgery shortly before, during, or after pregnancy cannot be adequately predicted. It is advisable to delay refractive surgery until refraction is documented to be stable in the post-partum period. However, further studies are needed to give a robust consensus.

References

1 Millodot M. The influence of pregnancy on the sensitivity of the cornea. *Br J Ophthalmol* 1977; **81**: 646–649.
2 Riss B, Riss P. Corneal sensitivity in pregnancy. *Ophthalmologica* 1981; **183**: 57–62.
3 Park SB, Lindahl KJ, Temnycky GO, Aquavella JV. The effect of pregnancy on corneal curvature. *CLAO J* 1992; **18**: 256–259.
4 Weinreb RN, Lu A, Beeson C. Maternal corneal thickness during pregnancy. *Am J Ophthalmol* 1988; **105**: 258–260.
5 Ziai N, Ory SJ, Khan AR, Brubaker RF. Beta-human chorionic gonadotropin, progesterone, and aqueous dynamics during pregnancy. *Arch Ophthalmol* 1994; **112**: 801–806.
6 *Duane's Ophthalmology: Pregnancy and the Mother's Eye* (CD-ROM). Clinical volume 5, Chapter 32. Hagerstown, MD: Lippincott Williams & Wilkins, 2001.
7 Akar Y, Yucel I, Akar ME, Zorlu G, Ari ES. Effect of pregnancy on intraobserver and intertechnique agreement in intraocular pressure measurements. *Ophthalmologica: Int J Ophthalmol* 2005; **219**: 36–42.
8 Manges TD, Banaitis DA, Roth N *et al.* Changes in optometric findings during pregnancy. *Am J Optom Physiol Opt* 1987; **64**: 159–166.
9 Pizzarello LD. Refractive changes in pregnancy. *Graefes Arch Clin Exp Ophthalmol* 2003; **241**: 484–488.
10 Neri A, Grausbord R, Kremer I, Ovadia J, Treister G. The management of labor in high myopic patients. *Eur J Obstet Gynecol Reprod Biol* 1985; **19**: 277–279.
11 Loncare K, Petrovic O, Brajac I. Myopia and operative delivery in Croatia. *Int J Gynecol Obstet* 2004; **85**: 287–288.
12 Imafidon CO, Imafidon JE. Contact lenses in pregnancy. *Br J Obstet Gynaecol* 1992; **99**: 865–867.
13 Sunness JS. The pregnant woman's eye. *Surv Ophthalmol* 1988; **32**: 219–238.
14 Hefetz I, Gershevich A, Haviv D *et al.* Influence of pregnancy and labour on the outcome of photorefractive keratectomy. *J Refract Surg* 1996; **12**: 511–512.
15 Sharif K. Regression of myopia induced by pregnancy after photorefractive keratectomy. *J Refract Surg* 1997; **13** (5 Suppl.): 445–446.
16 Starr MB. Pregnancy-associated over correction following myopic excimer laser photorefractive keratectomy. *Arch Ophthalmol* 1998; **116**: 1551.
17 Tally AR, Assil KK, Schanzlin D. Patient selection and evaluation. In: Talamo JH, Krueger RR (eds). *The Excimer Manual*. Boston: Little, Brown & Co, 1997: 38.
18 Dinn BR, Harris A, Marcus SP. Ocular changes in pregnancy. *Obstet Gynecol Surv* 2003; **58**: 137–144.