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Particularities of myopia in pregnancy

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Abstract

Although ocular conditions are commonly encountered in pregnancy, their management in pregnancy and during labor is still debate. Our review synthesizes the existing evidence on pregnancy and labor impact on visual outcome in myopic patients. We aimed to evaluate the changes in ocular physiology during pregnancy, the characteristics of myopia in pregnant population, the impact of epidural anesthesia and mode of delivery on myopia progression. High hormonal levels of pregnancy change corneal thickness and curvature, decrease sensitivity and reduce intraocular pressure. The existing evidence for ocular changes with pregnancy and expulsive effort in labor is rather poor. Myopic patients did not develop worsening of visual function after spontaneous vaginal delivery in any of the existing studies. Epidural anesthesia should be offered unrelated to ocular condition. Until further evidence will become available, vaginal delivery should be the standard for patients with ocular conditions in the absence of obstetrical contraindications.

Keywords: *myopia, labor, hormonal level, vaginal delivery*

Introduction

Major changes take place in the maternal body during pregnancy and delivery. Some of these changes are physiological, well tolerated and totally reversible a few months postpartum, while others can have a major impact on maternal body. Systemic changes that occur in pregnancy can influence the visual function. Some changes are reversible while others can cause permanent vision loss. One of the pre-existing ocular disorders altered by the pregnancy, under debate for a long time, is myopia, a common pathology in pregnancy. Myopia is a well known problem worldwide, with large global variation in prevalence and increasing frequency and severity throughout the world. Its magnitude is still not completely known[(1)].

Non-pathological myopia is commonly referred to as physiological, simple or school myopia. In non-pathologic myopia, the refractive structures of the eye develop within normal limits; however, the refractive power of the eye does not correlate with the axial length. The degree of non-pathologic myopia is usually minimal to moderate (< 6.00 diopters) with onset usually during childhood or adolescence. Pathologic myopia is generally classified as high myopic refractive error that is progressive and generally presents very early in childhood. Pathologic myopia is usually defined as spherical equivalent > 6.00 diopters or axial length > 26.5 mm. Patients with high axial myopia are at greater risk of developing progressive retinal degeneration or other vision threatening pathology[(2)].

It is well documented that pathological high myopia shows evidence of familial inheritance. High myopia is also a symptom of several multi-system diseases. The genetic mutations have been identified and the subsequent structural defects of the eye are most commonly related to connective tissue and retinal abnormalities. This type of myopia accounts only of a small proportion of the overall myopic population and, to date, there is no known isolated gene associated with physiologic myopia[(2)].

There is also a high incidence of complications associated with pathological myopia which were presumed to increase further more during pregnancy and labor. The retinal complications of high myopia leading to blindness are: retinal detachment, degeneration of the retina at the macula, bleeding behind the retina, due to formation of a choroidal neovascular membrane, formation of a macula hole. Patients with high myopia (spherical equivalent at least -6.0 D) are more susceptible to ocular abnormalities. The prevalence of glaucoma was higher in myopic adults, and the risks of chorioretinal abnormalities such as retinal detachment, chorioretinal atrophy and lacquer cracks increased with the severity of myopia and greater axial length. Myopic adults were more likely to have tilted, rotated, and larger discs as well as other optic disc abnormalities[(3)].

During the pregnancy, hormone secretion represents the main cause that will occur and will reach the peak during labor and delivery. The estrogen, progesterone, somatostatine, deoxycorticosterone, corticosteroid-binding globulin (CBG), cortisol, free cortisole, thyroxine, triiodothyronine and aldosterone levels are higher than in non-pregnant women. Hormones level will reach their pre-pregnancy values a few months after breastfeeding has been stopped[(4)].

The aim of the present review is to evaluate the changes in ocular physiology during pregnancy, the characteristics of myopia in pregnant women and the impact of epidural anesthesia and mode of delivery on myopia progression.

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Impact of pregnancy on ocular physiology

The effect of pregnancy on eye function has been extensively studied. Corneal changes are most likely due to water retention and include a decrease in corneal sensitivity and an increase in both corneal thickness and curvature. Therefore, despite previously effective use of contact lenses, many patients find difficult to manage them during pregnancy. It is best to delay fitting new contact lenses until several weeks postpartum. Corneal changes occur usually late in pregnancy and may produce temporary alterations in refraction, making pregnancy a contraindication for refractive eye surgery. This is mostly due to the fact that results of refractive eye surgery shortly before, during or after pregnancy cannot be predicted adequately. It is recommended to delay surgery and wait until refraction is stable in the postpartum period. Pregnancy may also induce dry-eye syndrome due to disruption of lachrymal acinary cells[5].

The second half of the pregnancy is associated with moderate decrease of intraocular pressure in normal eyes, which may be even greater in patients with preexisting ocular hypertension. This occurs due to increased aqueous outflow, decreased episcleral venous pressure, decreased scleral rigidity and generalized acidosis during pregnancy. Intraocular pressure typically returns to pre-pregnancy levels by two months postpartum[6].

A hormonally mediated increase in pigmentation around the eyes and cheeks is common and is called chloasma or 'mask of pregnancy'. Benign spider angiomas commonly develop on the face and upper body. These changes usually resolve postpartum. Ptosis, often unilateral, occurs during or after pregnancy probably as a result of defects in the levator aponeurosis caused by fluid, hormonal, and stress-related changes of labor and delivery[7].

Particularities of myopia in pregnant women

During pregnancy a shift towards myopia or an increase of myopia usually develops. This shift, however, is generally reversed after delivery or breast-feeding[2]. The presence of estrogen receptors has been proposed as cause of the physiological modifications in the cornea and lens during pregnancy, often leading to some degree of myopization and accommodation deficit. The cornea increases its central thickness between 1 and 16 μm due to edematous changes secondary to fluid retention in pregnancy. There is evidence that during pregnancy the cornea thickens secondary to excessive hydration of the stroma due to the activation of estrogen receptors and because of the influence of these hormones on the elasticity and biomechanics of corneal tissue. Some authors studied the refractive changes during pregnancy and found that about 14% of pregnant women had some changes in their visual acuity, refractive errors and myopic shift, changes that will return to pre-pregnancy levels within a few months after delivery[8]. The general consensus is that myopic shift is caused by the increased curvature of the lens, while the refractive changes develop due to changes in corneal curvature or thickness and/or tear film[4].

Several studies prove that refraction disorders triggered by pregnancy are marked by myopization, usually not very significant and always regressive within six weeks after childbirth[9]. According to those studies, there is a tendency towards worsening of the refractive function in the first half of pregnancy in women with refractive disorder history[7].

Refractive surgery during pregnancy is questionable due to temporary changes in ocular anatomy. A study on refractive changes after photorefractive keratectomy in pregnant patients revealed the impact of pregnancy on corneal wound healing after photorefractive keratectomy. 18 eyes were analyzed in women that became pregnant during follow-up period after keratectomy. During the postpartum period, there was an improvement in 50% of the eyes, with reduction of the corneal haze and associated myopic regression[10].

Natural vaginal delivery or cesarean section for myopic women?

Ocular pathology has been considered for a long time important for the decision regarding the mode of delivery. Myopia and other risk factors for retinal detachment were frequently used as indication for cesarean section in the past; it was thought that increased effort, mainly in the second stage of labor, would augment the risks of retinal detachment. The indication for cesarean delivery was usually the attribute of the ophthalmologist.

Most of the studies arise from Eastern Europe, where the large amount of cesarean sections for ophthalmic pathology has been considered a public health problem. One study from Poland retrospectively analyzed the prevalence of cesarean section for ophthalmic conditions between 2000 and 2008. The prevalence was 2.04%, the indication being usually written by the ophthalmologist. Myopia was an indication for 57% of the cases; other pathologies considered a contraindication for spontaneous delivery were retinopathy, past or imminent retinal detachment or glaucoma[11]. Ophthalmic pathology was the indication for cesarean section in over 20% of the non-obstetrical indications in another Polish retrospective analysis, exceeded only by hypertensive pathology[12].

There are a few studies with a small number of patients that assessed the changes in ocular morphology and physiology after vaginal delivery. In 1996, Prost and contributors studied 46 patients with high myopia and/or retinal detachment history; there was no progression of the changes after spontaneous vaginal delivery. Therefore, the authors pleaded for the safety of vaginal delivery in myopic patients[13]. Neri

and colleagues conducted a prospective trial in 1985 on 50 pregnant patients with high myopia; fundus examination was performed in all patients before and after spontaneous vaginal delivery. There were no significant changes observed; the authors concluded that spontaneous vaginal delivery is safe for the high myopic patient[14]. Another study assessed the impact of spontaneous vaginal delivery on high-risk retinal pathology; there was no worsening of retinal status after delivery, pointing as well towards spontaneous vaginal delivery for this category of population[15]. Other small studies provided the same conclusion[16,17].

Data on pregnancy and delivery impact on ocular pathology is somehow confusing. A Russian study on over 300 pregnancies with average and high myopia used, apart from conventional ophthalmology exam, rheoophthalmography to analyze intraocular pressure changes and ocular hemodynamics during pregnancy and delivery; the authors advocated that the monitoring algorithm they used, together with prolonged epidural analgesia in labor, managed to reduce the rate of operative delivery from over 20% to 1.3%[18]. However, there is no evidence in the literature that operative delivery decreases the risk of retinal detachment, while there is solid evidence that epidural analgesia slows the progress of labor and increases the rate of instrumental deliveries[19].

A retrospective study conducted in Croatia analysed the change in habits concerning the management of pregnancy in myopic patients between 2003 and 2009. Three groups were analysed depending on the severity of myopia, The prevalence of cesarean sections and the impact on visual function was compared between myopic patients and the existing data for emmetropic patients. There were no significant differences found in the rate of cesarean section; the visual function was similar postpartum when compared with antepartum values independent of the mode of delivery[20].

There are many practitioners who recommend either an assisted vaginal delivery with forceps or vacuum extraction or a caesarean section not only for high myopia, but also in cases of other pre-existing eye diseases such as retinal detachment, diabetic retinopathy, or glaucoma. This is mainly based on the increase of intraocular pressure during the second stage of labor. These recommendations, however, are not evidence-based[21]. As far as we know, there are not so many published trials that have reported any significant adverse retinal changes after vaginal delivery, therefore preexisting eye disease is not an indication for instrumental or operative delivery[22].

Epidural anesthesia in myopic pregnant patients

Another concerning issue for both obstetricians and ophthalmologists is the impact of epidural anesthesia, commonly used in current practice, for patients with myopia. Eye fundus, functional state of retina, intraocular pressure, central hemodynamics and cerebral circulation were examined in a study performed on 290 patients with moderate or severe myopia and in 25 healthy women during pregnancy, delivery and postpartum. About 255 patients delivered spontaneously vaginally with prolonged epidural anesthesia during first and second stages of labor. Epidural anesthesia was accompanied by decreasing vasoconstriction and both cerebral and ocular circulation improvement; there was no progression of myopic changes after delivery at one year follow-up[23].

Another study was performed on a total of 315 pregnant women from which 290 (92.1%) had myopia and 25 healthy patients (7.9%). An algorithm of pregnancy and delivery monitoring for myopic patients was developed comprising of ophthalmologic examinations and rheoophthalmography performed during delivery. Ocular hemodynamics and intraocular pressure and their dependence on the parameters of central hemodynamics and volumetric cerebral blood velocity were analyzed during different stages of spontaneous delivery. Prolonged epidural anesthesia normalized the hemodynamics of the ciliary tract and optimized the delivery in women with average and high myopia[18].

Travkin and contributors used of vasodilators and prolonged epidural anesthesia in pregnancy, analysing the impact on retinal blood flow; they used the rheographic quotient as a measure of uveal tract blood flow. The study promoted the prevention and treatment of retinal degeneration in myopic pregnant patients, using prolonged epidural anesthesia and vasodilators[24].

Ophtalmic pathology

Ophthalmic pathology has confused obstetricians and ophthalmologists for a long time regarding the impact of pregnancy and delivery on refractive changes in myopic eye. It was believed that the highest risk of worsening of refractive ocular pathology occurred during labor when the physical strain is at paroxysm. A study on over 350 patients found an incidence of subconjunctival bleeding of 10.5%; there was no intraocular or retrobulbar bleeding associated[25]. Increase in intraocular pressure in second stage of labor was considered a risk factor for retinal detachment and worsening of visual function. However, the studies on eye changes in postpartum patients after spontaneous delivery contradicted what was thought to belong to common sense. There was no significant adverse change in myopic eyes in any of the studies. The lack of adverse effects of increased pressure during labor was attributed to an equal distribution of intraocular pressure on all directions. Gradually, with accumulation of evidence, ocular conditions including myopia were not considered an indication for cesarean section anymore. Instrumental delivery was also advocated to decrease the risks of retinal detachment in myopic patients. However, there is no evidence to support that

decreasing the maternal expulsive effort and reducing the duration of second stage of labor would make any difference concerning maternal visual outcome.

Persisting resistance to the scientific evidence was encountered in East European countries that continued to have a high incidence of cesarean section in population with ocular pathology. Most of the recent studies on myopia in pregnancy were conducted in Poland, Bulgaria or Russia, in an attempt to decrease the incidence of cesarean section for non-obstetric causes. The indication for cesarean section was usually given by the ophthalmologist rather than the obstetrician. A decrease in the number of cesarean sections in patients with ophthalmic pathology in Eastern Europe was observed at present[8,11].

There are some studies that support the negative impact of physical strain on myopia progression[26,27]. However, the physical effort considered is occupational, involving repeated Valsalva maneuver performed over the years, on a long-term basis; on the contrary, Valsalva maneuver in labor is short acting, lasting only for a few hours maximum. Also, the average age of the population studied was significantly higher (over 50 years old) compared to the average age of the pregnant patients. It is well known that the risk for retinal detachment in myopia increases with the age, because of multiple factors, including various degenerations, vitreal liquefaction and retinal breaks[28,29]. All these confounders should be excluded to accurately analyze the impact of the physical exertion on myopia, which was not confirmed in any study on pregnant patients.

The reduced number of studies on pregnancy and labor impact on ocular physiology and refractive pathology is one of the main limitations of our review; also, most of the existing studies on pregnancy and labor effects on myopia have a small number of patients, limiting the statistical strength. There are no randomized trials to date to assess the potential effects of pregnancy and labor on visual function and to provide firm conclusions. Apart from the small sample size and the non-randomized design, another major drawback of the studies is the limited accessibility due to language utilized. Moreover, most of the reviewed studies were published in Polish, Russian or Bulgarian, limiting the understanding and a full insight into the results because of the language barriers[11,13,17,18,24].

Conclusions

There is no evidence that myopic changes worsen after vaginal delivery. All the existing studies failed to identify any adverse changes after spontaneous vaginal delivery in patients with refractive pathology or history of retinal surgery. Epidural anesthesia should be offered in pregnancy related to obstetrical indication. Until further well-conducted studies will become available, spontaneous vaginal delivery should be the preferred mode of delivery in the absence of any obstetrical indications, for myopic patients and/or history of retinal pathology. ■

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