Scleral ectasia in rhegmatogenous retinal detachment

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ABSTRACT • RÉSUMÉ

Objective: To determine the relation between retinal tears and scleral ectasia.

Design: Prospective study.

Setting: University-based referral practice in Montreal.

Patients: Fifty-seven consecutive patients with primary rhegmatogenous retinal detachments undergoing scleral buckling surgery. Patients with a history of trauma or previous cryotherapy, laser treatment or other vitreoretinal procedures were excluded. Fifteen patients with diabetes mellitus undergoing primary vitrectomy and prophylactic scleral buckling for nonclearing vitreous hemorrhage constituted the control group.

Outcome measures: Presence of scleral ectasia, visual acuity, refractive error.

Results: Thirty-one of the study patients were phakic and 26 were aphakic or pseudophakic. Fifteen (48.4%) of the phakic patients were found to have scleral ectasia, compared with six (23.1%) of the aphakic/pseudophakic patients and two (13.3%) of the control patients ($p < 0.05$, χ^2 test). The most frequent location of ectasia was the superotemporal quadrant. Retinal tears occurred in the same quadrant as scleral ectasia in 12 (80.0%) of the phakic patients.

Conclusions: Scleral ectasia may be causally related to rhegmatogenous retinal detachment in certain cases.

Objectif : Déterminer le rapport entre les déchirures rétiniennes et l'ectasie sclérale.

Conception : Étude prospective.

Contexte : Cas référés en milieu universitaire à Montréal.

Patients : Cinquante-sept patients consécutifs atteints d'un décollement rhegmatogène primaire de la rétine qui devaient subir une opération de plissement scléral. Les sujets ayant eu un traumatisme ou ayant déjà subi une cryothérapie, un traitement au laser ou d'autres opérations vitréorétiniennes ont été exclus. Le groupe témoin était constitué de quinze sujets diabétiques qui devaient subir une vitrectomie primaire et un plissement scléral prophylactique pour une hémorragie du vitré qui ne se résorbait pas.

Mesures des résultats : Présence d'une ectasie sclérale, acuité visuelle, erreur de réfraction.

Résultats : Des participants à l'étude, 31 avaient leur cristallin et 26 étaient aphaques ou pseudophaques. Quinze (48,4 %) des patients ayant leur cristallin avaient une

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ectasie sclérale, alors qu'on n'a observé cette affection que chez six (23,1 %) des aphaques ou pseudophaques et chez deux sujets (13,3 %) du groupe témoin ($p < 0,05$, test χ^2). L'ectasie se situait le plus souvent dans le quadrant supérotemporal. Des déchirures rétiniennes se trouvaient dans le même quadrant que l'ectasie sclérale chez douze (80,0 %) des sujets encore pourvus de cristallin.

Conclusions : Il peut y avoir, dans certains cas, un rapport de cause à effet entre l'ectasie sclérale et le décollement rhegmatogène de la rétine.

Scleral thinning, or scleral ectasia, has been associated with rhegmatogenous retinal detachments.[1,2] It usually involves the superotemporal quadrant, which is also the most frequent location of retinal tears. We suspect that scleral ectasia may be causally related to retinal tears in certain cases. We studied patients undergoing surgery for retinal detachment to determine the relation between retinal tears and scleral ectasia.

Methods

Fifty-seven consecutive patients from a university-based referral retina practice in Montreal who were scheduled to undergo primary scleral buckling surgery for rhegmatogenous retinal detachment were prospectively examined for scleral ectasia. Patients with a history of ocular trauma were excluded, as were those who had undergone previous retinal procedures, such as cryotherapy, laser treatment or other vitreoretinal procedures. Fifteen patients with diabetes mellitus undergoing primary vitrectomy and prophylactic scleral buckling for nonclearing vitreous hemorrhage constituted the control group.

Fig. 1—Moderate degree of scleral ectasia: Multiple linear ectatic areas extending radially in equator. Elliptical shape and dark colour are due to thinned sclera.

The refractive error and corrected visual acuity were determined for each patient, and a complete ocular history was obtained. The patients underwent slit-lamp biomicroscopy and binocular indirect ophthalmoscopy with scleral indentation. A large fundus drawing showing the location of tears and the extent of detachment was done before each surgical procedure. During surgery the sclera was exposed in all quadrants and examined for the presence of ectasia (Fig. 1).

Results

The 57 study patients were classified into two groups, phakic (31 patients) and aphakic or pseudophakic (26 patients). The mean age and sex of the patients are shown in Table 1.

The incidence of scleral ectasia among the patients with retinal detachment was 36.8% (21/57). Significantly more patients in the phakic group (15 [48.4%]) than in the aphakic/pseudophakic group (6 [23.1%]) or the control group (2 [13.3%]) showed evidence of scleral ectasia ($p < 0.05$, χ^2 test). The frequency of scleral ectasia in the aphakic/pseudophakic group did not differ significantly from that in the control group.

The most frequent location for scleral ectasia was the superotemporal quadrant (98.2%). Retinal tears

Table 1—Age and sex of 57 patients with primary rhegmatogenous retinal detachments who underwent scleral buckling surgery and 15 control patients

	Study patients		
Characteristic	Phakic (n = 31)	Aphakic/ pseudophakic (n = 26)	Control patients (n = 15)
Age, yr			
Mean	56	67	50
Range	25–79	46–84	20–81
Male:female ratio	1:1.2	1:1.4	1:0.8

occurred in the same quadrant as scleral ectasia in 12 (80.0%) of the phakic patients and 3 (50.0%) of the aphakic/pseudophakic patients, a nonsignificant difference (χ^2 test).

Among myopic phakic patients the mean refractive error was –2.96 dioptres for those with scleral ectasia, compared with –5.17 D for those without scleral ectasia ($p < 0.05$, *t*-test).

Lattice degeneration was more common among the phakic patients (8 [25.8%]) than among the aphakic/pseudophakic patients (1 [3.8%]) or the control patients (0 [0%]) ($p < 0.05$, χ^2 test). Of the eight phakic patients who had lattice degeneration only one had concurrent scleral ectasia.

Discussion

Abnormal vitreous traction is the cause of most retinal tears and detachments. In our study we excluded patients with an obvious cause of vitreoretinal disturbance, including a history of ocular trauma, previous vitreoretinal procedures and proliferative diabetic retinopathy.

The choice of using patients with diabetes as the control group was somewhat arbitrary. However, since there is no theoretical reason or pathological findings to suggest that diabetes has any influence on the condition of the sclera, we feel that the choice was adequate.

We found that scleral ectasia was frequently associated with retinal detachment. Since the frequency of scleral ectasia was significantly different between phakic patients and aphakic/pseudophakic patients, a possible causal relation between scleral ectasia and retinal tear can be postulated.

Confounding variables in the association between scleral ectasia and retinal tear or detachment in the phakic patients include lattice degeneration and myopia. Lattice degeneration is estimated to be present in about 40% of eyes with rhegmatogenous retinal detachment.[3] In our study lattice degeneration was present in eight patients (25.8%) with phakic detachments, only one of whom had scleral ectasia. Therefore, it is unlikely that lattice degeneration is an important confounding factor.

Myopia is a common cause of retinal detachment, either from lattice degeneration or an altered vitreoretinal relationship because of increased axial length. In a study of the relationship between myopia and retinal detachment Cambiaggi[4] found that patients with myopia over –8.00 D were predisposed to staphyloma and rhegmatogenous retinal detachment. In our study axial myopia was not a cause of retinal detachment in phakic patients; on the contrary, we found that among phakic patients, those with scleral ectasia were less myopic than those who had no ectasia.

The association of scleral ectasia with retinal detachment in certain cases is well documented.[1,2] However, its cause has not been established. Scleritis has been implicated as a cause of scleral ectasia, especially among patients with necrotizing scleritis.[5] None of our patients showed any sign of ocular inflammation.

Connective tissue disorders may also play a role in weakening the sclera. Studies have shown that patients with systemic collagen diseases, such as Ehlers–Danlos syndrome and Marfan's syndrome, are predisposed to scleral ectasia and retinal detachment.[2,6] Electron microscopic study of sclera from patients with rhegmatogenous retinal detachment showed that the scleral longitudinal fibre bundles are irregular and fragmented,[7] which may explain the association of retinal detachment with scleral thinning. None of our patients were known to have these disorders.

The propensity of scleral ectasia to occur in the superotemporal quadrant may be related to a structural weakness in this area. Watzke[1] suggested that this quadrant is an area where the vector forces of the two oblique muscles are directly opposite to the meridional orientation of the scleral lamella, thus resulting in derangements of scleral fibres. The tendency for scleral ectasia to develop in this quadrant may also be due to some developmental abnormality. In human ocular development the temporal retina is the last part of the retina to be vascularized. Further study is needed to investigate this possible association.

Although in our study phakic patients with scleral ectasia did not have more axial myopia than those without ectasia, localized myopia may play a role in the development of scleral ectasia in the superotemporal quadrant. Several studies have shown sectorial variation in the refractive state of the pigeon eye.[8–10] Holden and colleagues[11] found that there is graded myopia in the lower visual field and emmetropia in the horizontal and upper visual field of the pigeon eye. They suggested that this lower-field myopia represents an adaptation of the upper retina to near-conjugate to the ground when the bird is feeding, whereas the emmetropic upper field allows the pigeon to see distant predators or objects simultaneously. In humans the superotemporal quadrant of the retina may corre-

spond to the part of the retina that is near-conjugated to the nose. We speculate that in susceptible people this near-conjugation may lead to the development of localized myopia, which manifests itself as a localized thinning of the sclera.

This localized thinning of the sclera represents a staphylomatous process whereby the underlying choroid–retina complex may expand or stretch to accommodate the increased surface area created by the outward expansion of the sclera in that region. This may, in turn, cause an abnormal vitreoretinal relationship, with increased vitreous traction on the underlying or surrounding retina, resulting in a retinal tear.

In conclusion, we found that scleral ectasia was frequently associated with rhegmatogenous retinal detachment. In most cases it occurred in the same quadrant as retinal tears. A causal relation may exist between scleral ectasia and retinal tear. Further studies are needed to elucidate this association.

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