VITRECTOMY AND SILICONE OIL IN THE TREATMENT OF ACUTE ENDOPHTHALMITIS. PRELIMINARY RESULTS

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SUMMARY

Purpose: To evaluate the role of pars plana vitrectomy (PPV) and silicone oil injection in the treatment strategy of severe endophthalmitis.

Patients and methods: This study analyses a retrospective case series of 34 patients with signs and symptoms of severe endophthalmitis with visual acuity limited to light perception. All underwent PPV with intraocular injection of antibiotics (IOAB), together with topical and oral antibiotics. In 10 patients (group 1), this treatment alone was sufficient to control infection. In 10 other patients (group 2) with the same initial treatment, a new vitrectomy was needed: 8 because of retinal detachment, 2 because of persistent infection. In 2 patients (group 3), initially treated with PPV and IOAB, a second vitrectomy with IOAB and silicone oil tamponade was needed to stop infection. In 12 patients (group 4), with the worse prognosis related to the severity of infection and/or to associated retinal necrosis, PPV, IOAB and silicone oil tamponade were conducted at first surgery. Final anatomic status and visual acuity were assessed to compare the effectiveness of these different treatments.

Results: In 22 patients (group 1, 2 and 3) treated initially without silicone oil, 12 patients (55 %) needed further surgery, either for persistent infection or retinal detachment. Twelve patients (group 4) treated at first with silicone oil had a rapid control of the infectious process and better anatomical results with this procedure only. Final visual acuity was also better in the silicone oil groups (group 3 and 4) than in the non silicone groups (group 1 and 2).

Conclusion: These results suggest that silicone oil tamponade might be beneficial in the treatment strategy of severe endophthalmitis.

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RÉSUMÉ

Buts: Evaluation du rôle de la vitrectomie et l'injection d'huile de silicone dans la stratégie thérapeutique des endophtalmites sévères

Patients et méthodes: Cette étude rétrospective analyse une série de 34 patients présentant les signes d'une endophtalmite sévère, avec une acuité visuelle réduite à la perception de la lumière. Toutes furent traitées par vitrectomie et injection intra-vitréenne d'antibiotiques, accompagnées d'une antibiothérapie topique et générale. Dans 10 cas (groupe 1), ce seul traitement a suffi pour arrêter l'infection. Dix autres cas (groupe 2), qui avaient bénéficié dans un premier temps du même traitement, ont demandé une deuxième vitrectomie: 8 à cause d'un décollement de rétine et 2 à cause de la persistance de l'infection.
Dans 2 cas (groupe 3), traités dans un premier temps de la même manière, une seconde vitrectomie, accompagnée d'injection d'huile de silicone, a été nécessaire pour contrôler l'infection. Dans 12 cas (groupe 4), dont le pronostic était particulièrement réservé à cause de la sévérité de l'infection et/ou de la présence de plages de nécrose rétinienne, la vitrectomie avec antibiothérapie a été complétée d'emblée par une injection d'huile de silicone. Le status anatomique et l'acuité visuelle sont comparées dans les différents groupes pour tenter de cerner la meilleure approche thérapeutique.

Résultats: Parmi les 22 patients (groupes 1, 2 et 3), traités initialement sans injection d'huile de silicone, 12 (54 %) ont demandé une seconde chirurgie soit à cause de la persistance de l'infection, soit à la suite d'un décollement de rétine. Douze patients traités d'emblée par vitrectomie et injection d'huile de silicone, ont eu un contrôle rapide de leur infection et une meilleure stabilisation anatomique par cette seule procédure. L'acuité visuelle finale est aussi meilleure dans les groupes siliconés (groupes 3 et 4) que dans les groupes (groupes 1 et 2) traités sans huile de silicone.

Conclusion: Les résultats de cette étude suggèrent que le tamponnement par huile de silicone pourrait avoir un effet bénéfique dans la stratégie thérapeutique des endophtalmites sévères.

KEY-WORDS

endophthalmitis, vitrectomy, retinal detachment, silicone oil.

MOTS-CLÉS

endophtalmite, vitrectomie, décollement de rétine, huile de silicone.

INTRODUCTION

Infectious endophthalmitis is one of the most serious complications of intraocular surgery and has a very poor prognosis (4, 11) and important hospital charges. The role of pars plana vitrectomy (PPV) in the treatment of endophthalmitis is controversial. The results of the Endophthalmitis Vitrectomy Study (EVS) suggested that patients, with a visual acuity of light perception, have better prognosis if treated with immediate PPV (5).

Silicone oil has been used increasingly in vitreoretinal surgery as an internal tamponade, with a significant improvement of the anatomical and visual outcome in many hopeless cases (14).

The dynamics of silicone involve surface tension and viscosity, but also limit the free movements of aqueous humor in the eye. No particles seem to be able to penetrate and develop within this inert material (14). Moreover, antibacterial properties of silicone oil have been recently reported in vitro (18).

Since the early nineties, vitreoretinal surgeons have used silicone oil in some cases of endophthalmitis with extensive retinal damage as intraocular tamponade in order to prevent retinal detachment. The purpose of the present retrospective study was to compare evolution of endophthalmitis in patients treated with PPV and intraocular injection of antibiotics (IOAB) with or without silicone oil tamponade.

PATIENTS AND METHODS

We reviewed the records of 34 consecutive patients (16 females and 18 males) who underwent pars plana vitrectomy because of severe endophthalmitis secondary to phakoemulsification (27 patients), perforating trauma (4 patients), combined phako and trabeculectomy (1 patient), trabeculectomy (1 patient) or scleral buckling (1 patient). Their ages ranged from 8 to 95 years. All patients had been referred to the Ophthalmology Department of St Pierre University Hospital Brussels, Belgium, between January 1994 and September 2001. The clinical diagnosis was based on the standard sign and symptoms of endophthalmitis: pain, loss

of vision, lid oedema, conjunctival chemosis and injection, corneal oedema, anterior chamber flare, hypopyon, and vitreous opacification. Culture and/or electron microscopic studies of vitreous samples subsequently confirmed the diagnosis in all cases.

According to EVS study, these patients, presenting with severe reduction of visual acuity (LP) and/or no visibility of the fundus, were treated by pars plana vitrectomy and intraocular antibiotic injections (Ceftazidime 2.2 mg - Vancomycine 1 mg). In group 1 (n=10), patients requested only one surgery to stabilize infection and anatomical status. In group 2 (n=10), a second PPV was needed because of persistent infection (group 2A: 2 patients) or for secondary retinal detachment (group 2B: 8 patients). Additional PPV and IOAB were used in group 2A, whereas PPV, retinopexy and SF6 tamponade were performed in group 2B. In group 3 (n=2), endophthalmitis still progressed after the first surgery and a second vitrectomy with reduced doses of IOAB (Ceftazidime 0.5 mg - Vancomycine 0.25 mg) and silicone oil tamponade finally controlled the situation. In group 4 (n=12), extensive retinal necrosis, limited retinal detachment or peripheral retinal holes, discovered during the initial procedure, requested silicone oil tamponade (1000 centistoke) at first surgery (Table 1) in addition to intraocular injection of reduced doses of antibiotics (Ceftazidime 0.5 mg - Vancomycine 0.25 mg). In all patients, topical antibiotics and corticosteriods together with oral quinolones were used in the postoperative period. In group 3 and 4, silicone oil was removed under local anaesthesia about one month after surgery.

The follow-up ranged from 1 to 48 months (mean=16 months). Anatomical status and visual outcome were recorded in order to compare the prognosis of different approaches.

RESULTS

In the 20 patients (group 1 and 2) initially treated with PPV and IOAB, only 10 patients (50 %) (group1) did not need further surgery, whereas the other 10 (50 %) (group 2) needed a second PPV without silicone oil tamponade: two (10 %) because of uncontrolled infection and eight (40 %) because of secondary retinal detachment.

In the third group, 2 patients, who were first treated with PPV and IOAB, needed a second PPV with IOAB and silicone oil tamponade because uncontrolled endophthalmitis and risk of retinal detachment due to areas of retinal necrosis.

In the fourth group (n=12), all but one patients (92 %), who were initially treated with PPV and silicone oil, had controlled infection and anatomical stabilization at the first procedure and did not need further surgery, except for removal of silicone oil one month later. Only one complication occurred during or after this latter procedure. In one case (8 %), unfortunately, a severe PVR induced loss of vision (NLP) but the cosmetic result was acceptable.

In group 1 and 2 (20 patients), who did not received silicone oil, 10 patients (50 %) improved their visual acuity, (V.A. ranging from 0.05 to 0.9; average 0.4). Among them, 9 gained an useful vision (0.1 or more); 3 had a good visual acuity (0.5 or more), but visual acuity did not improve in one patient. In the same groups, 10 patients (50 %) had worse final visual acuity, among which 3 (15 %) ended with no light perception.

In the 14 patients of groups 3 and 4, who received silicone oil tamponade, 11 patients (79 %) improved their final visual acuity ranging from 0.05 to 1.0, (average 0.4), and 10 gained an useful visual acuity (0.1 or more); 4 had a good visual acuity (0.5 or more) and only

Table 1: *Treatment groups.*

	N. of Patients	First Treatment	Second Treatment	
Group 1	10	PPV+IOAB	None	
Group 2	10	PPV+IOAB	n=2 PPV+IOAB for infection	n=8 PPV+ SF6 for R.D.
Group 3	2	PPV+IOAB	PPV +IOAB+Si.oil for infection	
Group 4	12	PPV +IOAB+Si.oil	None	

PPV= Pars plana vitrectomy; IOAB= intraocular antibiotics; Si.Oil= Silicone oil Tamponade.

Table 2: *Visual Acuity Results.*

	Better V.A. (0.05-0.9)	Useful V.A. > 0.1	Good V.A. > 0.5	Worse V.A.	No L.P
Group 1&2 (n=20) PPV+IOAB	10/20	9/10	3/9	10/20	3
Group 3&4 (n=14) PPV+ IOAB+ Si. oil	11/14	10/11	4/10	3/14	1

PPV= Pars plana vitrectomy; IOAB= intraocular antibiotics, V.A.= Visual Acuity, R.D.= Retinal Detachment

3 patients (14 %) had worse final visual acuity. Among them, one patient (7 %) ended with no light perception due to PVR complication (Table 2).

DISCUSSION

Fifty-four percent (12 patients) of 22 patients (group 1, 2 and 3) who initially underwent simple PPV and IOAB needed a second operation because of uncontrolled infection in 18 % (4 patients) and retinal detachment in 36 % (8 patients). On the contrary, all 12 patients (group 4) who were initially treated with PPV and silicone oil tamponade had their infection controlled right away and did not need other further treatment than silicone oil removal. Surprisingly, they had initial poorer prognosis because of extensive retinal necrosis, retinal holes or pre-existing limited detachment, contrasting with a better final issue.

Patients treated with silicone oil seem to obtain better final visual acuity than patients who were treated by PPV and IOAB only. Indeed, 71 % (10/14 patients) of group 3 and 4 gained useful vision and 28 % (4/14 patients) had vision better than 0.5. On the other hand, 45 % (9/20 patients) of group 1 and 2 had useful vision and 15 % (3/20 patients) had vision better than 0.5. Moreover, only 7 % (1/14 patients) in group 3 and 4 ended with no light perception, contrasting with 15 % (3/20 patients) in group 1 and 2.

The relation between silicone oil and endophthalmitis has not been deeply discussed in the literature. Endophthalmitis is a rare complication of vitrectomies which has been reported in 0.046 to 0.07 % of large series (12), and might be even more exceptional if vitrectomy is associated with silicone oil injection, since only two cases with culture proven endophthalmitis have been reported in the literature (3,20). Other authors have described two patients who developed hypopyon and marked anterior chamber fibrin after vitreous surgery with silicone oil tamponade (9). Endophthalmitis has been considered in the differential diagnosis, but the authors suggested that the cause of inflammation was a reaction to the low molecular weight components and impurities in the silicone oil (7, 10).

The potential antimicrobial properties of silicone oil in vitro have only recently been reported in the literature: Özdamar et al (18) have shown, in culture media, that silicone oil decreases the proliferation of the most common pathogens responsible for endophthalmitis but nothing has been published yet about in vivo experience.

In human eyes, action of silicone oil could be explained by different mechanisms. First, silicone oil could be toxic for bacteria, as suggested in vitro, but this remains to be confirmed by additional animal experiences.

Silicone oil is known to be highly hydrophobic with a high interfacial tension and consequently impervious to cells and bacteria (8). Therefore, it limits space for free movement of infectious agents and maintains them in close contact with the ciliary body and retinal vessels, which might improve the efficacy of human defence mechanisms, with higher concentration of biochemical mediators, antibodies and inflammatory cells within the limited aqueous phase of the vitreous cavity.

According to the literature (1, 6, 13, 16, 17), retinal detachment is a frequent complication of endophthalmitis. In the present study, 40 % (8/20) (group 2B) of the patients treated with a simple PPV (groups 1 and 2) needed a second surgery for this reason. In the groups of patients treated with silicone oil tamponade (groups 3 and 4), only one of the 14 cases (7 %) had complication of retinal detachment with PVR, although retinal lesions were more severe at presentation. None of the other 13 patients had

this complication, even when silicone oil was removed.

In the literature, endophthalmitis is suspected to increase the risk of retinal detachment. EVS reported 20 cases of retinal detachment in a series of 420 patients, 6 in the vitrectomy group (2.8 % of 218 patients) and 14 in the non vitrectomy group (6.9 % of 202 patients). Nelsen and co-workers (17) described retinal detachment to occur in 21 % (7/34) of endophthalmitis patients treated with vitrectomy and intraocular antibiotics. Our series gives a similar complication rate with 26 % of retinal detachments (9/34): 8 patients (23 %) in the non silicone groups (1 and 2), 1 patient (7 %) in the silicone groups (3 and 4). It has been postulated that retinal detachment could be either the result of surgical complications or be provoked by the changes in retina and vitreous as a reaction to severe ocular inflammation.

Many authors also reported that concurrent endophthalmitis and retinal detachment have a poor visual and anatomical outcome, especially when retinal detachment is an intraoperative complication (2, 11, 15, 19, 20).

Silicone oil, due to its high surface tension, tamponades retinal defects of any size in the most frequently affected areas of the retina. Filling the eye with silicone oil, until the inflammation calmed down, might reduce the risk of retinal detachment complication, and improve the chance of a better final visual outcome.

When the situation is totally controlled, silicone oil could be removed without complications in our series, with a simple procedure.

CONCLUSION

This retrospective study suggests that silicone oil tamponade might be beneficial in the treatment strategy of severe endophthalmitis. Patients treated with silicone oil have better control of infection, better anatomical stabilization and better final visual acuity. Additionally, silicone oil tamponade seems to reduce the risk of retinal detachment and the need of additional curative procedures.

The role of silicone oil intraocular tamponade in cases of severe endophthalmitis should be further evaluated in a prospective manner in order to confirm the provisional conclusions of the present study.

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