SILICONE OIL TAMPONADE IN THE VITREORETINAL SURGERY

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SUMMARY

This retrospective study aimed to evaluate the influence of a temporary silicone oil (SiO) tamponade on intraocular pressure (IOP). We reviewed 131 procedures with a temporary SiO tamponade for different indications. Visual outcome and anatomic results after the SiO removal were also analyzed. Relatively good visual and anatomic results can be achieved by a temporary SiO tamponade with an acceptable complication rate.

SAMENVATTING

In deze retrospectieve studie werd de oogdruk gedurende en na SiO tamponade geëvalueerd. Het betreft 131 procedures waarbij SiO noodzakelijk was als tijdelijke tamponade bij verschillende indicaties. Tevens werden de visuele en anatomische resultaten geanalyseerd. Hoewel een belangrijk aantal complicaties aan de SiO worden toegeschreven, blijkt uit onze studie dat bij correct gebruik van SiO, in combinatie met adequate chirurgie, mooie anatomische en visuele resultaten kunnen bereikt worden.

RESUME

Cette étude rétrospective évalue la tension oculaire pendant et après la tamponade par huile de silicone. Il s'agit d'une étude de 131 cas pour lesquels l'huile de silicone était nécessaire comme tamponade temporaire dans différentes indications. Nous avons aussi analysé les résultats visuels et anatomiques de ces interventions. Bien qu'un nombre important de complications dues à la tamponade par huile de silicone ont été décrits, il apparait dans notre étude qu'un usage correct de l'huile de silicone associé avec une chirurgie méticuleuse permet d'obtenir de bons résultats, tant visuels qu'anatomiques.

KEY WORDS

Vitrectomy, silicone oil, IOP.

MOTS CLES

Vitrectomie, huile de silicone, tension oculaire.

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MATERIALS AND METHODS

Vitrectomized patients with SiO tamponade and subsequent removal between January '97 and June '98 were retrospectively analyzed. A procedure includes a vitrectomy with SiO injection, possible reoperations under SiO and a final vitrectomy with SiO removal, all realized at our clinic. One patient underwent this procedure 3 times, two patients twice and both eyes of 2 patients were included. 127 eyes were enrolled in this study. The patients were subdivided in 5 groups: 38 trauma cases, 71 proliferative vitreoretinopathy (PVR) cases (C2-D3), 10 proliferative diabetic retinopathies (PDR), 9 age-related macular degenerations and 3 uveitis cases. Eighty-three males and 41 females participated. The mean age was 49 years (± 22,5 SD, range: 4-88 years). SiO tamponade was present for a median duration of 17 weeks and the mean follow-up was 50 weeks. Twenty patients already had an elevated IOP ($\geqslant$ 23 mmHg) before the SiO tamponade, 14 out of these 20 were under antiglaucoma (AG) therapy.
An elevated IOP was considered as an IOP $\geqslant$ 23 mmHg. The cupping of the optic disc was not considered. Hypotony means IOP $<$ 5 mmHg. Secondary glaucoma is defined as persistent IOP elevation in a preoperative normotensive eye. Anatomic success is achieved when a complete flattening of the retina is obtained.

SURGICAL TECHNIQUE

A pars plana vitrectomy was performed, followed by epi- and occasionally subretinal membrane peeling. The vitreous base was meticulously shaved. After creating an inferior iridectomy in aphakic eyes, SiO (1000 centistokes) was subsequently injected. Prolonged endodrainage was performed to achieve an optimal fill. Finally endolaser, sometimes combined with exocryocoagulation, was applied. In cases of reproliferations, reoperations are performed under SiO. The ultimate goal is SiO removal.

PURPOSE

Statistical analysis of the influence of vitrectomy with temporary SiO tamponade on IOP. Anatomic results and visual outcome will be discussed as well.

RESULTS

1. IOP

In 44 of the 131 procedures an elevated IOP was noted. This covers all kinds of IOP elevations (acute, chronic, immediate postoperative in known glaucomatous eyes and transient elevations). The incidence of IOP elevation was 9 out of 38 trauma cases, 26 out of 71 PVR cases, 4 out of PDR, 4 out of 9 ARMD and 1 out of 3 uveitis cases. We compared the 2 groups with the highest IOP incidence (PVR, trauma) to analyze the relationship between IOP elevation and surgical indication. No significant statistical difference was found between these two surgical indication groups with regard to IOP elevation. (Figure 1).
Fourty-three (98%) of these IOP elevations normalized with medical therapy or in case of an acute glaucoma with an iridectomy (5 eyes). The medical therapy implicated mostly a monotherapy with a betablocker, sometimes combined with a complementary AG collyrium. Acetazolamide (Diamox) was temporarily administered in a few cases. In one patient the SiO had to be removed because of uncontrolable IOP elevations. This patient with a history of congenital cataract and glaucoma already presented with severely elevated IOP before the SiO tamponade.
The main issue in fact was to find out which eyes developed secondary glaucoma due to SiO tamponade. A permanently elevated IOP was

Fig 1.

Fig 2.

noted in 10 eyes after SiO removal (with a mean follow-up after SiO removal of 45,5 weeks). Six of them were already diagnosed and treated as glaucomatous eyes before the SiO tamponade. Three of the 4 remaining IOP elevations after SiO removal were due to neovascular glaucoma. Only one patient developed an IOP elevation 6 months after SiO removal. A betablocker was started, which normalized the IOP efficiently.
We noted the time occurrence of all IOP elevations (figure 2).

Twenty-four of 44 IOP elevations occurred in the first week (figure 2). Eighty-seven % of the IOP elevations occurred within the first 3 weeks. Since most IOP elevations occurred in the early postoperatively period, we tried to withdraw the AG therapy during the tamponade (usually within 5 weeks after starting it) in 50% of the cases with IOP elevation. In 90% the IOP remained normal after the withdrawal. No effort was made in the remaining 50% for several reasons: (1) a too short duration of the SiO tamponade, (2) the patient returned to his own ophthalmologist who continued the AG drops, (3) glaucoma was diagnosed before the SiO tamponade. So at least 45% of the IOP elevations were transient. We analyzed the duration of the SiO tamponade in the 2 groups (with/without IOP elevation). The mean duration in the group with IOP elevation (21 weeks) was shorter than this in the group with normal IOP (26 weeks) (figure 3). The difference was not significant (p=0,15).
An evaluation of the lensstatus of eyes with IOP elevation was performed. Thirty % of the aphakic, 34% of the phakic and 29% of the pseudophakic patients experienced an IOP elevation (figure 4).

DRSiO = duration SiO in weeks
IOP E = IOP elevation

Fig 3.

Fig 4.

The patients with an IOP elevation were significantly older (p=0.04) than those with a normal eye pressure during SiO tamponade (55 years versus 46 years).

2. VISUAL ACUITY

To evaluate the visual outcome the patients were divided into 7 groups as the table shows (Figure 5).
The bold diagonal represents the procedures in which the visual acuity remained status quo (40/129 = 31%). Below this line are 5 patients (4%) with a worse visual acuity after SiO removal. Two of them indicated no light perception due to an ischemic optic nerve insult. The majority of the patients (84/129 = 65%) is above the diagonal. They regained a better visual acuity after the surgery. Ambulatory vision (> counting fingers at 1 meter) was present in 93/129 (72%) of the procedures.

3. ANATOMY

The anatomic success reached 90% (116/129). We only considered 129 procedures since one retina could not be visualized by the referring ophthalmologist due to corneal edema and phthisis was noted in one eye. In 13 out of 129 procedures the retina was still detached. But since we are considering procedures and 3 patients underwent more than one procedure, their retina was flat in the last procedure. This means that in only 9 eyes no anatomic success was achieved. To obtain this success rate, 35 patients needed a revision vitrectomy with SiO within their procedure and a third vitrectomy was necessary in 5 cases.

> 0.5	0	3	0	0	2	0	2
> 0.3-0.5	0	7	2	2	1	0	0
> 0.1-0.3	0	8	2	5	4	0	0
0.05-0.1	0	18	7	2	0	0	0
CTF 1m - < 0.05	1	26	1	0	0	0	0
LP - < CTF 1m	0	31	2	1	0	0	0
nLP	0	2	0	0	0	0	0
	nLp	LP < CTF 1m	CTF 1m < 0.05	0.05 0.1	> 0.1 0.3	> 0.3 0.5	> 0.5

Visual acuity pre SiO

LP = light perception
CTF = counting fingers

Fig 5. Visual acuity post SiO removal

Hypotony (IOP $<$ 5 mmHg) occurred in 4 eyes (3%). Corneal pathology was noted in 6 eyes (5%): 3 cases of bandkeratopathy and 3 eyes with corneal decompensation.

DISCUSSION

The use of SiO as an intraocular tamponade in retinal detachment surgery was first reported in 1962 (4). Ever since, SiO has been used more frequently (13). Vision threatening complications evoked a lot of criticism considering the use of SiO. Many complications though, are a result of the abuse of SiO (12). We noted in our study 44 IOP elevations in 131 procedures. This seems a high incidence at first sight but one must consider that our definition (IOP $\geq$ 23 mmHg) was very severe compared to other studies which use 25 mmHg and even 30 mmHg as a limit of elevated pressure (2,3,6,8,10) and that all IOP elevations were included (acute, chronic, transient, glaucomatous eyes).

Since 98% of these IOP elevations normalized with therapy, these IOP elevations did not influence initial visual recovery as suggested in other publications (7,11). In contrast with our results, removal of silicone oil and/or aggressive glaucoma surgery was often necessary in other studies (7,8). It is very interesting that 55% of IOP elevations occurred the first week and 87% the first 3 weeks. Temporary postoperative inflammation could result in IOP elevation (5). Withdrawal of AG therapy pointed out that at least 45% of the IOP elevations were transient. This reinforces the idea of postoperative inflammation as a etiologic factor. We must not forget that SiO is used in eyes with complicated retinal detachments which often need extensive surgery. Another explanation for the transient IOP elevations could be that these eyes need some time to adapt to a changed fluid physiology. Reattachment of the retina after longstanding detachment could also play an additional etiologic role. Anyway these results point out the importance of closely monitoring the IOP the first 3 postoperative weeks. Some of the IOP elevations could have been induced by corticosteroids. Most eyes became normotensive when the corticosteriods were replaced by non-steroid anti-inflammatory drugs. Only one eye of 127 ($<$ 1%) developed a so-called secondary glaucoma, possibly resulting from the temporary SiO tamponade. We can conclude that permanent IOP elevation after SiO removal is very rare. No difference was found in the duration of the SiO tamponade between the groups with and without IOP elevation. Yet wet always try to maintain the intravitreal tamponade no longer than necessary. A possible explanation for our result (the group without IOP elevation had a longer SiO tamponade) may be that eyes with more severe pathology require a longer tamponade and rarely show IOP elevation. Other studies however have opposite results (7,11). Lens status doesn't seem to have an obvious influence on the incidence of IOP elevation. Thanks to the inferior iridectomy introduced by Ando (1), the aphakic eyes are not more at risk for IOP complications than the phakic and pseudophakic eyes. The patients with an IOP elevation were significantly older ($p=0.04$) than those with a normal eye pressure during SiO tamponade (55 years versus 46 years). This finding was also demonstrated in another study (7).

In our series 86% of the eyes achieved a better (65%) or stable (31%) visual acuity after SiO removal. An ambulatory vision was noted in 93%. This success rate emphasizes that even in heavily damaged eyes it is worth not to exclude them for surgery. In our study an anatomic success was obtained in 92% of the eyes. In the remaining 9 eyes no further attempt was made because of lack of motivation of the patient or poor prognosis in visual acuity. Only 4 eyes became hypotonic in our series although the complication of hypotony seems almost as important as IOP elevation in other publications (3,9,10). During the follow-up period phthisis was noted in one eye. The cornea of 3 eyes decompensated in contrast with other studies with a high incidence of corneal problems (10). Silicone-corneal contact seems to be a crucial factor. Nevertheless it is difficult to determine whether this is due to the SiO or due to the multiple surgical procedures.

The current study demonstrates that SiO is an acceptable longacting retinal tamponade. IOP elevation is a common occurrence after intravitreal SiO injection but the underlying mechanism is probably multifactorial in nature (5). Monitoring of the IOP is mandatory especially during the first 3 postoperative weeks. Visual

and anatomic results after SiO tamponade are satisfactory although sometimes multiple surgeries are required. Most complications can be avoided by correct clinical use of SiO in combination with adequate surgery.

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