Silicone oil surgery in children

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Introduction

Vitreo-retinal diseases requiring surgical intervention in children differ from those in adults. Rhegmatogenous retinal detachment has an annual incidence of 12.4 cases per 100,000 in the adult population. Rhegmatogenous retinal detachment occurring in the pediatric age group (birth to 15 years of age) accounts for only 3.2% to 5.6% of the total with over 40% of cases secondary to ocular trauma. Other causes of retinal detachment in pediatric age group include high myopia, retinopathy of prematurity, familial exudative vitreoretinopathy, acute retinal necrosis, prior ocular surgery and retinoschisis. Given the 89% frequency of vision-threatening abnormalities in the fellow eyes, preserving vision in the detached eye is of great importance. The eye with the retinal detachment may be the better seeing eye in the long run.

The use of silicone oil as a temporary tamponade agent in cases with complex retinal detachment is often associated with serious complications like recurrent detachments (14%) following silicone oil removal, glaucoma (2%), keratopathy (15-20%) and hypotony (25%-30%). The goal of this study was to evaluate the results and complications of temporary silicone oil tamponade in consecutive cases of pediatric retinal detachments.

Materials and Methods

We reviewed the charts of consecutive children (age less than 18 years) who underwent repair of retinal detachment with silicone oil injection in our hospital between January 1999 to December 2004. Thirty eyes of thirty patients with a minimum follow up of 20 months were included in the study.

The following data were collected from the case records of these patients: age, sex, detailed ocular history, preoperative diagnosis, details of preoperative evaluation, operative procedure, duration of silicone oil tamponade, complications if any following silicone oil injection and after its removal.

Preoperative and postoperative best corrected Snellen visual acuity (also with pinhole correction) and pre and postoperative tonometry (Goldmann applanation tonometry or non-contact tonometry) were recorded. All causes for poor visual acuity following retinal detachment repair were noted. These included macular degeneration, macular hole, cystoid macular oedema, recurrent retinal detachment under oil, glaucoma, hypotony and optic atrophy. Postoperative slit lamp examination details documented were presence of keratopathy, silicone oil in the anterior chamber, evidence of oil emulsification, presence of any iris neovascularisation and the status of the lens. Details of fundus examination included presence of buckle, presence or absence of a peripheral retinal detachment at time of silicone oil removal and grading of proliferative vitreo retinopathy according to the Retina Society Classification (1983).

All operations were performed by the same surgeon (MC). Our vitrectomy technique with silicone oil tamponade included the following: - scleral buckling with encirclage and standard three-port parsplana vitrectomy. The vitreous removal was as complete as possible and shaving of the vitreous base was performed. The retina was mobilised by removing all epiretinal and subretinal membranes and strings. Relaxing retinectomies were performed only as a last resort in cases where the retina remained rigid. Lensectomy was carried out if the lens opacities precluded visualisation for vitrectomy and in eyes with anterior proliferative
vitreoretinopathy. Subsequently in these eyes a peripheral iridectomy was made at the 6 o’clock position. In all cases mechanical retinal flattening was achieved using perfluoro carbon liquid, which was exchanged for silicone oil (1000 centistokes). Four or five rows of endolaser photocoagulation were applied as a standard procedure over 360 degree and around any pre-existing breaks or retinectomies. Reoperations were preformed under silicone oil for recurrent retinal detachment. During reoperation all the aqueous and emulsified silicone oil were removed from anterior chamber and from beneath the silicone oil bubble, epi and subretinal membranes were removed and the Japanese iridectomy opened up. When a partial peripheral retinal detachment existed anterior to the encircling element it was treated locally by barrage laser. In all patients 6 weeks prior to silicone oil removal a 360 degrees additional laser retinopexy was performed using the Laser Indirect Ophthalmoscopic delivery system Fig (1).

Indications for silicone oil removal was a stable situation with an attached retina posterior to the encircling scleral buckle, presence of silicone oil emulsification or anterior segment complications like keratopathy, glaucoma or oil cornea touch. Our technique of silicone oil removal was through 2 parsplana sclerotomies. When additional procedures had to be carried out such as endolaser photocoagulation, lensectomy or phacoemulsification, removal of epi retinal membrane or removal of subretinal membranes a three-port vitrectomy was performed.

**Results**

Of the 30 patients, 20 were males (66.7%) and 10 females (33.3 %). The mean age was 8 years and the mean follow up was 20 months. The mean duration of silicone oil tamponade was 7.0±2 months. All patients had complicated retinal detachments associated with the following conditions (Table 1).

<table>
<thead>
<tr>
<th>Ocular Condition</th>
<th>No. of Eyes</th>
</tr>
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<tbody>
<tr>
<td>High Myopia</td>
<td>12 (40%)</td>
</tr>
<tr>
<td>Penetrating Injury</td>
<td>2 (6.6%)</td>
</tr>
<tr>
<td>Giant Retinal Tear</td>
<td>4 (13.3%)</td>
</tr>
<tr>
<td>Familial Exudative Vitreo Retinopathy</td>
<td>2 (6.6%)</td>
</tr>
<tr>
<td>Retinoschisis</td>
<td>4 (13.3%)</td>
</tr>
<tr>
<td>Acute Retinal Necrosis</td>
<td>2 (6.6%)</td>
</tr>
<tr>
<td>PVR Following SB Procedure</td>
<td>4 (13.3%)</td>
</tr>
</tbody>
</table>

Following the initial retinal detachment repair anatomic reattachment was achieved in 20% of eyes with one surgery and 40% of eyes in 2 surgeries. On follow up reproliferation caused recurrent RD in 81% of eyes undergoing reoperation under silicone oil. Complications during SO tamponade are given in Table 2.

<table>
<thead>
<tr>
<th>Complication</th>
<th>% of Eyes (Present Study)</th>
<th>Silicone Oil Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glaucoma</td>
<td>10%</td>
<td>5 - 10%</td>
</tr>
<tr>
<td>Keratopathy</td>
<td>7%</td>
<td>20%</td>
</tr>
<tr>
<td>Hypotony</td>
<td>9%</td>
<td>27.30%</td>
</tr>
<tr>
<td>Recurrent RD</td>
<td>40%</td>
<td>43%</td>
</tr>
</tbody>
</table>

Silicone oil removal was performed in all eyes. Redetachment after silicone oil removal occurred in 19% of eyes at a mean period of 2.6 weeks. Causes of redetachment were persistent traction due to proliferative vitreoretinopathy, opening up of preexisting breaks or retinotomy drainage sites or formation of new breaks. In 45% of patients there was a 2-line improvement in visual acuity following silicone oil removal. 80% of patients achieved a visual acuity of ≥ 2/60. Final anatomic reattachment rate achieved was 64% after silicone oil removal. Macular degeneration (10%), macular hole (3.3 %), epi macular membrane (10 %), Glaucoma (10 %), and Optic atrophy (3%) were the main causes for poor vision.

**Discussion**

The silicone oil study was designed to evaluate the benefits and risks of using a long acting gas bubble or silicone oil as an intraocular tamponade following vitrectomy in eyes with severe proliferative vitreo retinopathy. The study enrolled patients had
proliferative vitreoretinopathy of at least Gr C3 (Retina Society Classification), were at least 18 years of age or more, had visual acuity better than no light perception (NPL) and had sufficient contracture so that intraocular dissection was required. The complications following semi permanent tamponade with silicone oil included incomplete reattachment, macular detachment, persistent elevation of intraocular pressure (5-10%), chronic hypotony (27.3%) and keratopathy (20%).

The removal of silicone oil, although not without risk provides certain potential benefits, most important being an improvement in visual acuity, opportunity to eliminate media opacities and preretinal membranes. Development of recurrent retinal detachment following silicone oil removal in 14% of cases occurred within 6 months of silicone oil removal. The rapidity of retinal detachment after silicone oil removal suggest residual traction or in some instances anteriorly located retinal detachment could extend to the posterior pole after silicone oil removal, new breaks from surgical manipulation or reopening of preexisting breaks due to release of silicone oil tamponade. Reinforcement of choroidal adhesion by Laser Indirect Ophthalmoscopic delivery system prior to silicone oil removal, elimination of significant residual pre retinal traction at the time of oil removal will decrease the rate of retinal detachment. Those eyes with retinal detachment present at the time of silicone oil removal had a particularly poor prognosis.

The primary rationale of oil removal after retinal reattachment is avoidance of long term complications. Unfortunately the silicone study data indicates that oil removal does not entirely prevent future problems. Appearance of late onset keratopathy in 30% of eyes is due to damage to the endothelium caused by small oil droplets which may remain even after meticulous removal and due to the surgical trauma of removing the silicone oil.

Temporary silicone oil tamponade can be effectively used in children for repair of complex retinal detachments. Indeed silicone oil tamponade is preferred in children due to various reasons including the complex nature of the detachments in childhood and the difficulty in positioning a child post operatively following gas tamponade.

The complications following silicone oil tamponade and the incidence of recurrence following removal of silicone oil are comparable to that in adults in the silicone oil study. Semi permanent tamponade with silicone oil in children differed from that in adults in the lower incidence of sterile post operative reaction (3.3%), lower incidence of keratopathy (7% Vs 20%) and lesser incidence of hypotony (9% Vs 27.3%). These results could be attributed to the lower rate of macula off recurrent detachment under oil and the better tolerance to systemic steroids administered post operatively to counter intraocular inflammation. Redetachment following silicone oil removal was slightly higher (19% Vs 14%) than reported in the silicone oil study population and occurred at a mean period of 2.6 weeks following silicone oil removal. Visual acuity improvement to 5/60 following silicone oil removal was observed in 45% of our series and is comparable to the silicone oil study. Prior to silicone oil removal it is mandatory to perform a detailed and thorough fundus evaluation if needed under short general anaesthesia and to reinforce the laser barrage by Laser Indirect Ophthalmoscopic delivery.

Visual rehabilitation by contact lens correction or aphakic glasses after silicone oil removal, occlusion therapy for amblyopia, regular scheduled examination of fellow eye, regular monitoring of IOP all contribute to the final visual recovery.

Temporary silicone oil tamponade can be effectively used in children for repair of complex retinal detachments. The complications following SO tamponade and the incidence of recurrence following silicone oil removal are comparable to that in adults in the silicone oil study. However the incidences of Keratopathy (7% Vs 20%) and Hypotony (9% Vs 27.3%) were surprisingly lower than in the silicone oil study indicating that children tolerated silicone oil tamponade much better than adult. Silicone oil tamponade is preferred in children due to various reasons including difficulty in postoperative positioning following gas tamponade and the complex nature of retinal detachment, which occur in childhood.

Reference
In 1890 he went to Vienna to study Ophthalmology and moved to London in 1891 as an ophthalmologist. Patients continued to elude him, so in 1891 he finally gave up the practice of Medicine and became a fulltime writer.

Around this time he wanted to stop writing Sherlock Holmes’ stories so that he had the time for more “important” things. In November 1891, he wrote to his mother that he was thinking of slaying Holmes and winding up the series for good. However when he actually did this in 1893, in a short story called “The Final Problem”, the public outcry and indignation was so great that he was obliged to bring Holmes back. This he did in 1903 in a story called “The Adventure of the Empty House”.

His last book featuring Sherlock Holmes was a collection of short stories called “The Case Book of Sherlock Holmes” published in 1927.

Conan Doyle possessed some of the qualities Holmes had and with his keen sense of justice was able to set free two men who were wrongly convicted and imprisoned. This was partly responsible for the setting up of the Court of Criminal Appeal in 1907.

By 1920, Doyle had become one of the most highly paid writers in the world. Though best known for his detective stories, Doyle also wrote historical novels, science fiction, plays, romances, poetry and non-fiction. His historical novels include “The White Company” and “The Adventures of Brigadier Gerard”. His science fiction stories featured Professor George Edward Challenger, modeled after another of his teachers at Edinburgh.

During the Boer War (1899 – 1902) in South Africa, Doyle served in a field hospital. He wrote a pamphlet, “The War in South Africa” and a longer book “The Great Boer War” in which he justified the much criticized role of Britain in that war. Doyle was knighted in 1902 for having supported his country.

He displayed the same uncritical attitude to the British Empire in his history of World War I which he published in 1928.

Conan Doyle ran for Parliament in 1900 and again in 1906. He was unsuccessful both times yet polled a significant number of votes.

He was a keen footballer and a lover of cricket. He helped form the Portsmouth Football Club and was its goalkeeper.

Doyle married twice and had five children in all. His first wife Louisa died of tuberculosis in 1906 and he married Jean Leckie in 1907.

Towards the end of his life and following the deaths of his son, brother, two brothers-in-law and two nephews in World War I, Doyle became depressed. He found solace in Spiritualism and its belief in existence beyond the grave. He wrote a Professor Challenger novel on the subject and “The History of Spiritualism” in 1926. He also believed in fairies and wrote a book “The Coming of the Fairies” in 1921.

Sir Arthur Conan Doyle died of heart disease on July 7, 1930, aged 71, at his home in Sussex. He was buried in Minstead, New Forest, Hampshire.