DOI: 10.5603/OJ.2022.0010

Successful surgical treatment of traumatic macular hole with total rhegmatogenous retinal detachment in a child

Sławomir Cisiecki[1, 2], **Karolina Bonińska**[1, 2], **Maciej Bednarski**[1, 2]

[1]*Medical Center Julianow, Lodz, Poland*
[2]*Dr K Jonscher Municipal Medical Centre, Lodz, Poland*

ABSTRACT

BACKGROUND: The purpose of this case report was to investigate the surgical results and morphologic characteristics of a pediatric traumatic macular hole with total rhegmatogenous retinal detachment.

CASE PRESENTATION: The 4-year-old male patient underwent scleral buckling surgery combined with vitrectomy with the inverted internal limiting membrane (ILM) flap technique and silicone oil tamponade for five months. Complete ophthalmic examination was performed preoperatively and 7 days, 1, 3, 6, 9, and 12 months after surgery. Successful retinal reattachment was achieved, and the macular hole was successfully closed. Visual acuity improved from hand motion at the initial visit to 20/80 (0.6 LogMAR) postoperatively.

CONCLUSIONS: Scleral buckling surgery and vitrectomy with the inverted ILM flap technique appeared to give effective anatomical and functional results in the pediatric post-traumatic case with macular hole and retinal detachment.

KEY WORDS: blunt ocular trauma; macular hole; retinal detachment

Ophthalmol J 2022; Vol. 7, 61–64

INTRODUCTION

Retinal detachment associated with macular hole (MHRD) occurs predominantly in highly myopic eyes and staphyloma but also has been noted after blunt ocular trauma [1–4]. Although its pathogenesis remains uncertain, it is believed that MHRD can be created via two pathomechanisms. Firstly, the macular hole may allow liquified vitreous into the subretinal space and lead to retinal detachment. The retinal detachment is located in the posterior pole and may spread forward without accompanying tears. In the second suggested pathomechanism, the retinal detachment, starting from a tear or tears in the circumference, spreads backward. Stretching the tissues over the macula leads to macular hole development. It may also arise from anterior–posterior vitreoretinal tractional forces [5, 6].

In MHRD, vitrectomy with internal limiting membrane (ILM) peeling has become the effective surgical approach [7–10]. The potential risk of postoperative cataract formation is acknowledged [11]. When the patient is a child, choosing the correct surgical approach is especially challenging because of the risk of amblyopia.

This paper presents a rare case of successfully surgically treated pediatric full-thickness macular

CORRESPONDING AUTHOR:
Karolina Bonińska, MD, PhD, Centrum Medyczne "Julianów", ul. Żeglarska 4, 91–321 Łódź, tel: (+48) 607 816 193; e-mail: karolina.boninska@gmail.com

hole associated with total retinal detachment and dialysis.

CASE PRESENTATION

Two days after blunt trauma to the right eye, a 4-year-old male patient presented in our ophthalmic clinic. The history of previous intraocular procedures and general diseases was negative.

A full ophthalmic examination with indirect biomicroscopy was performed. The visual acuity (VA) in the right eye was Hand Motion (20/4000; LogMAR 2.3) and was 20/25 (LogMAR 0.04) in the left eye. The intraocular pressure measured by palpation was within the normal range. No abnormalities were found in the anterior segment of either eye or the fundus examination of the left eye. The fundus examination of the right eye showed a full-thickness macular hole (FTMH) and upper temporal dialysis with total retinal detachment in all four quadrants. No choroidal rupture was detected.

Swept-source optical coherence tomography (SS-OCT) (DRI OCT Triton plus, Topcon, Japan) examination and eye ultrasonography were performed (Fig. 1, 2).

The patient was admitted to the ophthalmic department for surgical treatment.

The procedure was performed under combined intravenous-volatile general anesthesia.

The eye was encircled with silicone band type 41 after placing mattress suture 6/0 Ethilon in four quadrants without tying. 23-gauge, 3-port traditional core, and peripheral vitrectomy were then performed. Perifoveal posterior vitreous detachment (PVD) was observed. The ILM was stained for 1 minute with membrane blue dye (DORC, Rotterdam, the Netherlands). Perfluorocarbon liquid (PFCL) (Perfluorodecalin, F-Decalin, Fluoron GmbH, Germany) was introduced, and the inverted ILM flap technique was performed [12]. The ILM was grasped under PFCL during circumferential peeling and left attached to the edges of the macular hole and then inverted so that it was laying over the hole on the surface of the retina.

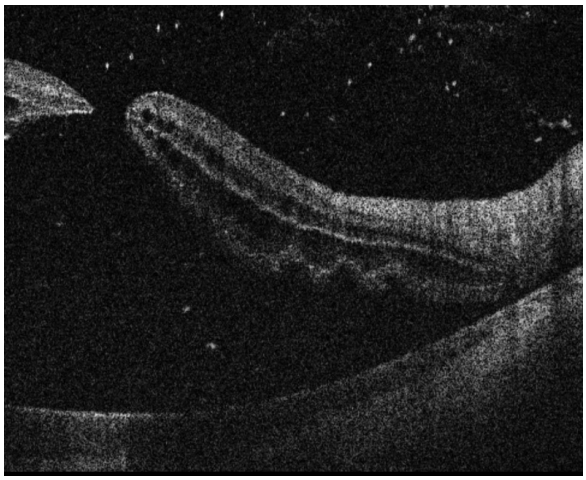

FIGURE 1. Preoperative swept-source optical coherence tomography (SS-OCT) image demonstrates macular hole with posterior vitreous detachment and total retinal detachment

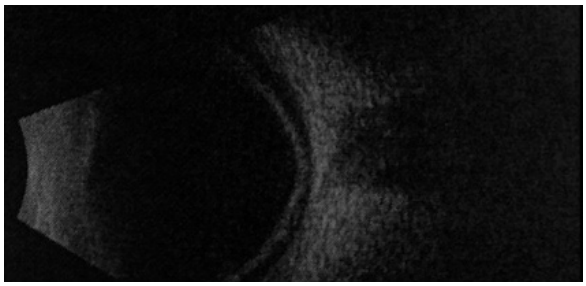

FIGURE 2. B-mode ultrasound imaging — total retinal detachment

A small peripheral retinotomy was performed over the PFCL bubble to facilitate the subretinal fluid/air exchange. PVD was not forced to the periphery because of the potential risk of iatrogenic breaks and was therefore finished at the temporal arcades. Extensive peripheral vitrectomy was avoided so as not to touch the lens and cause cataract.

After fluid/air exchange, the eye was completely filled with PFCL, which was then exchanged for 5000 cs silicone oil. The 360° buckle was then sutured in order to close retinal dialysis while carefully monitoring intraocular pressure. Sclerotomies were closed with Nylon 10/0 and conjunctiva with 7/0 Vicryl.

Successful macular hole closure was achieved and noted at the first control one week after surgery. The retina was reattached (Fig. 3). The silicone oil was removed after five months. Postoperatively, fovea architecture gradually improved, and best-corrected visual acuity (BCVA) also showed improvement (Fig. 4A–E). Final BCVA improved to 20/80 (0.6 LogMAR). No cataract formation has been observed in the follow-up period (currently 12 months).

DISCUSSION

The most challenging aspect of the described case was determining how to attain retinal reat-

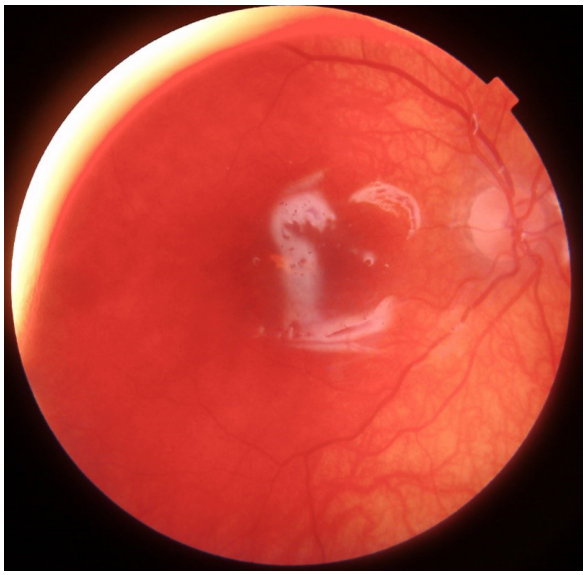

FIGURE 3. Postoperative color fundus photography demonstrates retinal reattachment with silicone oil tamponade

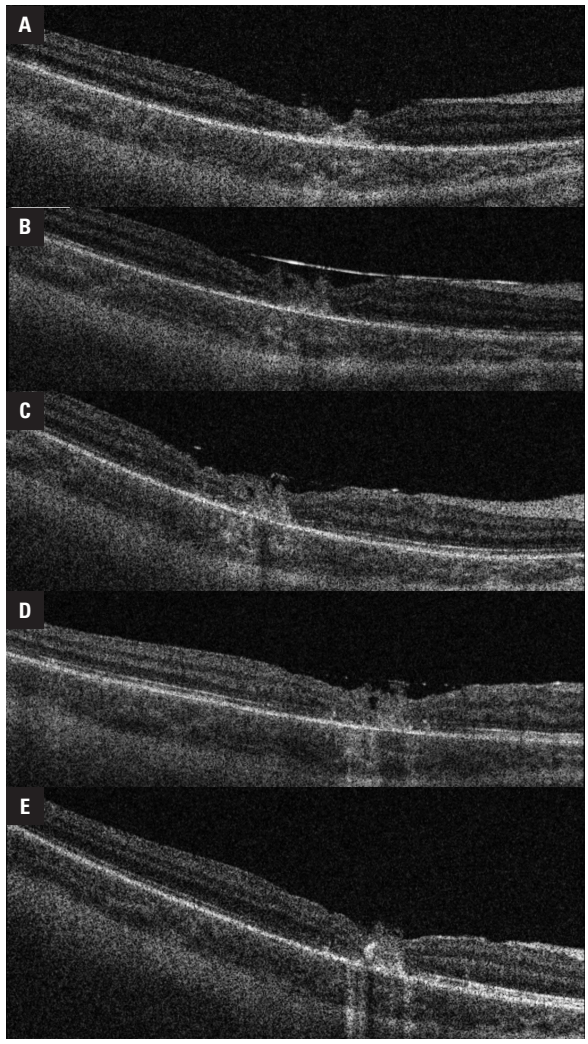

FIGURE 4. Postoperative swept-source optical coherence tomography (SS-OCT) images. **A.** One week after surgery; **B.** One month postoperatively; **C.** Three months postoperatively; **D.** Six months postoperatively; **E.** One year postoperatively

tachment and macular hole closure at the same time. The 87.5% success rate of scleral buckling in total retinal detachment caused by retinal dialysis is very high [13]. Moreover, traumatic full-thickness macular holes can close spontaneously with time [14–16]. However, in our experience, this can take 6 months or more, which is unacceptable in a child because of the risk of amblyopia. Additionally, the early observation of perifoveal PVD and large macular hole diameter, in this case, reduced the chances of spontaneous closure [14–16].

In this particular case, we had to choose between retinal reattachment only, with just a segmental or 360° buckle, hoping that the FTMH would close spontaneously at some time. Or we could attempt to close the macular hole and reattach the retina in a single procedure by combining vitrectomy and scleral buckling. Choosing the second option also meant that we did not need to perform a complete vitrectomy. The anterior vitreous was left, and the risk of cataract formation was, therefore, decreased [11].

Our observation confirm Ghoraba et al. The authors compared two groups of pediatric traumatic retinal detachment treated with vitrectomy with or without an encircling band. Although there was no statistically significant difference between these two groups, they suggest that the rationale for adding a scleral buckle is to support the vitreous base and to preserve the clear crystalline lens. Moreover, the buckle may decrease traction from PVR. A suggested advantage is that the buckle might decrease the need for retinotomies and/or retinectomies or decrease their size [17].

The inverted ILM flap technique is a novel surgical technique reported to enhance the closure of complicated cases of the macular hole [12]. As it is a technique routinely used in our department, and covering macular holes with the inverted ILM flap has given us a 100% success rate, we felt confident that it was the most suitable method in this case**.** The only failures we have experienced are when ILM flap displacement occurs. Silicone oil was used due to the patient's inability to maintain a prone position for any length of time.

CONCLUSIONS

Our experience in this single case suggests that in pediatric MHRD, scleral buckling with vitrectomy enables good anatomical and functional results. In 12 months of follow-up, no redetachment has been seen, the MH remains closed, and there are no signs of cataract formation.

Data availability statements

Written informed consent for publication of their clinical details and clinical images was obtained from the patient's relative. A copy of the consent form is available for review by the journal's editor.

All data generated and analysed during this study are included in this published article.

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Funding

None declared

REFERENCES

1. Siam A. Macular hole with central retinal detachment in high myopia with posterior staphyloma. Br J Ophthalmol. 1969; 53(1): 62–63, doi: 10.1136/bjo.53.1.62, indexed in Pubmed: 5775575.
2. Stirpe M, Michels RG. Retinal detachment in highly myopic eyes due to macular holes and epiretinal traction. Retina. 1990; 10(2): 113–114, doi: 10.1097/00006982-199004000-00004, indexed in Pubmed: 2402551.
3. Ohsugi H, Ikuno Y, Matsuba S, et al. MORPHOLOGIC CHARACTERISTICS OF MACULAR HOLE AND MACULAR HOLE RETINAL DETACHMENT ASSOCIATED WITH EXTREME MYOPIA. Retina. 2019; 39(7): 1312–1318, doi: 10.1097/IAE.0000000000002155, indexed in Pubmed: 29554077.
4. Lim LS, Tsai A, Wong D, et al. Prognostic factor analysis of vitrectomy for retinal detachment associated with myopic macular holes. Ophthalmology. 2014; 121(1): 305–310, doi: 10.1016/j.ophtha.2013.08.033, indexed in Pubmed: 24139155.
5. Wu AL, Ling KP, Chuang LH, et al. Treatment of macular hole retinal detachment with macular plug in highly myopic eyes: three-year results. Acta Ophthalmol. 2020; 98(7): e839–e847, doi: 10.1111/aos.14418, indexed in Pubmed: 32243725.
6. Morita H, Ideta H, Ito K, et al. Causative factors of retinal detachment in macular holes. Retina. 1991; 11(3): 281–284, doi: 10.1097/00006982-199111030-00002, indexed in Pubmed: 1961986.
7. Oie Y, Emi K, Takaoka G, et al. Effect of indocyanine green staining in peeling of internal limiting membrane for retinal detachment resulting from macular hole in myopic eyes. Ophthalmology. 2007; 114(2): 303–306, doi: 10.1016/j.ophtha.2006.07.052, indexed in Pubmed: 17194478.
8. Ripandelli G, Coppé AM, Fedeli R, et al. Evaluation of primary surgical procedures for retinal detachment with macular hole in highly myopic eyes: a comparison [corrected] of vitrectomy versus posterior episcleral buckling surgery. Ophthalmology. 2001; 108(12): 2258–64; discussion 2265, doi: 10.1016/s0161-6420(01)00861-2, indexed in Pubmed: 11733267.
9. Lim LS, Tsai A, Wong D, et al. Prognostic factor analysis of vitrectomy for retinal detachment associated with myopic macular holes. Ophthalmology. 2014; 121(1): 305–310, doi: 10.1016/j.ophtha.2013.08.033, indexed in Pubmed: 24139155.
10. Seike C, Kusaka S, Sakagami K, et al. Reopening of macular holes in highly myopic eyes with retinal detachments. Retina. 1997; 17(1): 2–6, doi: 10.1097/00006982-199701000-00001, indexed in Pubmed: 9051834.
11. Petermeier K, Szurman P, Bartz-Schmidt U, et al. Pathophysiologie der Katarakt-Entwicklung nach Vitrektomie. Klin Monbl Augenheilkd. 2010; 227(03): 175–180, doi: 10.1055/s-0029-1245271.
12. Michalewska Z, Michalewski J, Adelman RA, et al. Inverted internal limiting membrane flap technique for large macular holes. Ophthalmology. 2010; 117(10): 2018–2025, doi: 10.1016/j.ophtha.2010.02.011, indexed in Pubmed: 20541263.
13. Chang JS, Marra K, Flynn HW, et al. Scleral Buckling in the Treatment of Retinal Detachment Due to Retinal Dialysis. Ophthalmic Surg Lasers Imaging Retina. 2016; 47(4): 336–340, doi: 10.3928/23258160-20160324-06, indexed in Pubmed: 27065373.
14. Yamashita T, Uemara A, Uchino E, et al. Spontaneous closure of traumatic macular hole. Am J Ophthalmol. 2002; 133(2): 230–235, doi: 10.1016/s0002-9394(01)01303-4, indexed in Pubmed: 11812427.
15. Mitamura Y, Saito W, Ishida M, et al. Spontaneous closure of traumatic macular hole. Retina. 2001; 21(4): 385–389, doi: 10.1097/00006982-200108000-00020, indexed in Pubmed: 11508892.
16. Sartori Jd, Stefanini F, Moraes NS. Spontaneous closure of pediatric traumatic macular hole: case report and spectral-domain OCT follow-up. Arq Bras Oftalmol. 2012; 75(4): 286–288, doi: 10.1590/s0004-27492012000400015, indexed in Pubmed: 23258664.
17. Ghoraba HH, Mansour HO, Abdelhafez MA, et al. Comparison Between Pars Plana Vitrectomy with and without Encircling Band in the Treatment of Pediatric Traumatic Rhegmatogenous Retinal Detachment. Clin Ophthalmol. 2020; 14: 3271–3277, doi: 10.2147/OPTH.S275778, indexed in Pubmed: 33116378.