PEDIATRIC RETINAL DETACHMENT SURGICAL REPORTS FROM TERTIARY HOSPITAL in Jakarta, INDONESIA

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Original Article

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Key words : pediatric, retinal detachment, injury, local anesthesia

Abstract

Purpose : Pediatric retinal detachment is a rare case. We report the surgical management and its outcome. **Material and Methods** : Retrospective descriptive study of surgical management of pediatric retinal detachment. **Result**: There were 13 patients (13 eyes) with ages 3 – 17 years, 10 were male and 3 were female. Causes of detachment were trauma (69.2%), high myopia >3 dioptre (15.4%), previous lensectomy procedure (7.7%), and exudative retinopathy (7.7%). The duration of detachment ranges between 2 - 156 weeks (X: 32.08 +/- 49.31). Twelve cases were managed with vitrectomy and one with scleral buckle. Anatomically attached retina was achieved in 9 cases, the failed cases caused by reproliferation of vitreous. VA improved in 8 cases, stable in 4 cases and decrease in 1 case (p-value= 0.14). Silicone oil was used in 9 cases, SF6 gas in 3 cases. Despite retina attached in 69.2%, VA was not improved significantly. Complications were secondary glaucoma, cataract and macular pucker. Follow up ranges from 9 days – 15 months, three patients had follow-up visit less than two weeks. **Conclusion** : In

pediatric retinal detachment, long detachment and those caused by injury have a poor prognosis for visual improvement.

Introduction

Rhegmatogenous retinal detachment could happen spontaneously following idiopathic break in peripheral retinal and could also happen after intra ocular procedure such as cataract surgery, filtering surgery, intra vitreal injection, and vitrectomy. Cumulatively incidency of retinal detachment is vary depending on follow-up time and patient demographics 0.2%-3.6% in 4 years after cataract surgery, considered higher in younger myopic patients, and increasing to 1.3% in 10 years.[1,2,3] Conditions like posterior capsular rupture, high myopia and history of injury are risk factors for retinal detachment after surgery. Pediatric retinal detachment incidence – less than 18 years old of age - is much lower than adults and this age grup comprises 3.2-6.6% of all cases of RD. Pediatric RD is a severe threat to vision due to delayed diagnosis, complicating conditions, and an immature visual system. The treatment requires a different approach compared to adults.[4,5]

Surgical managements of pediatric retinal detachment vary between each institute. Some emphasize scleral buckling (SB) surgery,[6] others prefer vitrectomy surgery, and others on buckling with vitrectomy. While the surgeon skill and preference are very important, the condition of the eye has been a significant factor in determining the type of technique management to be applied. Each technique has its advantages and disadvantages, but key of success is visual acuity result after surgery.[4,7]

Many studies reported surgical outcome with various results. To the best of author's knowledge, there is no report of pediatric retinal detachment surgery from Indonesia so far. This study aims to report the outcome of surgical management of pediatric retinal detachment with factors contributing to the outcome.

Material and Methods

This is a retrospective eye study done by collecting patients' medical record with surgical management for retinal detachment, less than 18 years of age in Cikini Hospital from November 2002 until January 2013. The Christian University of Indonesia Institutional Ethics Committee granted approval for this study (IRB Departemen I P Mata UKI SK No. 2/07/2013), study conducted following the tenets of the Declaration of Helsinki.

Optical media clarity, condition of the lens and posterior capsule, the pupil and iris, presence of synechiae were observed by routine examination, including intraocular pressure measurement. Posterior segment examination/funduscopy was done thoroughly checking the retinal periphery as well as the macula and optic nerve head. The location of lesion or retinal tear was determined precisely on presurgical examination to determine the surgery type/techniques and the prognose. Informed consent was prepared to make sure the patient and/or family really understand the risk that they are facing, including the successful rate anatomically and functionally and the procedures that needed to be done and the possibility of a second surgery if needed. Detachment recorded as long detachment if occurred more than six weeks.

The procedures were done under general anesthesia. If the patient is old enough and considered tolerant to local anesthesia, then the surgery was done with retrobulbar local anesthesia using 2ml lidocaine 2% mixed with 3ml marcain in one syringe. If needed, extra 2ml of marcain is administered given retrobulbarly or subtenon towards the optical nerve during surgery. Before the procedure, pupil is dilated maximally by using Mydriatil™ 1% and Efrisel™ 2.5% or 10% depending on age with interval of 10 minutes and was given minimum three times before the procedure. If silicone band is chosen as the buckle, the choice is diameter 2.5 mm with sleeve in lower or upper nasal. The indentation of silicon band as optimal as possible, with target medium scleral buckle indentation. The silicon band's distance is generally 9 -11 mm or less behind limbus depending on the patient's age. If scleral buckling (SB) technique is chosen, the surgeon use tyre size 7 mm with convex surface. The tyre length is adjusted with the area that needs to be indented. Cryopexy has to be done accurately at the retinal break area, to give effect to the area surrounding the tear and to minimalize the cryopexy. If vitrectomy is the choice, the sclerotomy is done between 1.5 - 3 mm behind the limbus and vitrectomy is done as clean as possible and cautiously as to not create iatrogenic retinal break. Lens sparing vitrectomy is preferred. If there is simple detachment with clear media, SB is chosen unless there are other conditions such as lens dislocation, cloudy media, undetermined retinal break, small pupil or large/multiple break. Retinal membrane was peeled and retinal massaging was done under heavy fluid. Endolaser was done 360^0, 3 - 4 rows on the buckle effect and 360^0 surrounding of the retinal break(s). The number of laser rows was added up to 6-8 lines if there is any severe proliferative vitroretinopathy (PVR). If needed, tyre 7 mm was added to vitrectomy procedure to cover

problematic area such as PVR in the peripheral region that can not be freed. Vitreous tamponade used was SF6 20% gas or silicone oil 1000 cs. Gas was chosen unless for some conditions such as recurrent retinal detachment, giant retinal tear, and if patient had to go back to a remote area immediately. Subconjunctival injections of Gentamicin and corticosteroids were used at the end of the procedure. Patient's position was postured contralateral to the break after surgery. Any significant findings during and after the surgery were also noted. Patients were instructed to have follow up visit at day 1,3, and 14 after the surgery in the first month and afterwards every 1-2 months in the first 6 months. Topical antibiotics and steroids are given for one month with tapering off dosage, anti glaucoma is given if needed. If silicone oil tamponade is used, removal will be done 2 - 6 months after surgery.

Statistical analysisis done with SPSS 15.0, using statistical test such as Paired t-test, independent t-test after normality test with Kolmogorov Smirnov test, confidence interval 95% and Mann-Whitney U test.

Result

There were 13 patients who fulfill the requirements, 76.9% of them were male and 23.1% were female. The age range was 3 – 17 years, with the mean of 12.77 $\pm$ 4.49 years. The detachment duration occured 2 - 156 weeks, with the mean of 32.08 +/- 49.31 weeks. The causes of detachment were trauma in nine patients (69.2%), high myopia >3 dioptre in two patients (15.4%), previous lensectomy procedure and exudative retinopathy each one patient (7.7%). Patients demographic is shown in Table 1.

Surgery was done under local anesthesia in two patients and general anesthesia in 11 patients. Patients tolerance to pain after given local anesthetic was good, with minimal pain. There were 12 patients that underwent vitrectomy and one patient with SB. Of 12 patients who had vitrectomy, nine of them got silicone oil tamponade and the last three was filled with SF6 20% gas. The pre operative findings were PVR grade B (2 patients), PVR grade C2 (1 patient), giant retinal tear (GRT) (2 patients) and vitreous bleeding (1 patient).

Anatomic successful rate was 69.2%, while 30.8% had recurrent detachment. The cause of recurrent detachment were PVR and retinal open break post surgery. Complications were secondary glaucoma, cataract, macular pucker and severe uveitis with severe neovascularization. In one case with severe neovascularization, it occurred one week after silicone oil evacuation and lens implantation. The patient was given 0.1 ml bevazicumab and 4 mg triamcinolone acetate intravitreal injection. Neovascularization regression shown dramatically in 2 days. Follow-up duration ranges from 9 days – 15 months, three patients had follow-up visit less than two weeks.

Visual acuity was improved in eight cases, stable in four cases and decrease in one case, all cases underwent standard surgical technique. Mean pre operative best corrected visual acuity (BCVA) was 0.039 ± 0.071 and post operative best corrected visual acuity (BCVA) was 0.114 ± 0.144 (*p-value*= 0.146). Post operative visual acuity was not affected by the duration of detachment either 2 weeks or less, 4 weeks or less, and 8 weeks or less (p-value = 0.566, p-value = 0.796, and p-value = 0.855 respectively. The visual outcome of attached retina was also not influenced by the duration of retinal detachment. These data are shown in Table 2.

Discussion

Higher scleral buckling technique is preferred in pediatric retinal detachment cases,[8] but in this study indentation was medium due to risk of ischemia. Scleral buckling technique is preferred than vitrectomy itself in pediatric cases, because vitrectomy is more complex and has a higher rate of complications. Pediatric vitreous cortex usually attach firmly to retina that makes it hard to safely separate it mechanically during vitrectomy.[9] In younger children, compliance for supine position is also hard to achieve. The choice is for scleral buckling for suitable cases with clear media, unless there are other conditions such as dislocated lens, cloudy media, undetermined retinal break, small pupil and/or large/multiple tears.[8,9] Besides, lens sparing vitrectomy is difficult to achieve during pediatric vitrectomy, especially in babies and children with underdeveloped pars plana. In this study only one case (0.07%) underwent SB, the others were vitrectomized.

There were no mature pars plana in babies as a safe entry port doing vitrectomy. As a rule of thumb, an 8 months baby has pars plana 2 mm behind the limbus. Therefore sclerotomy was made further anterior compared to adult cases. Since pediatric lens size in comparison to anterior segment is bigger than of adults, more cautious procedures are needed during surgery such as doing equipment insertion and vitrectomy for lens sparing vitrectomy.[8] The 23-gauge vitrectomy is commony chosen especially in pediatric patients, though the risk of postoperative hypotony. Some surgeon made parallel or perpendicular incisions to the alignment of scleral fibers. Parallel and perpendicular incisions resulted in similar postoperative hypotony rates, but perpendicular incisions were associated with lower postoperative intraocular pressure (IOP).[10] There are

surgeons who prefer to do internal limiting membrane (ILM) peeling during retinal detachment surgery for all cases. Study in monkey showed the retinal structures were well preserved after ILM peeling. However, ILM peeling resulted in mild damage to the vitreoretinal interface, which was not completely restored even after 3 years.[11]

Complications after pediatric retinal surgery are limited eye development, amblyopia due to the use of cycloplegic eye drop, proliferative vitreoretinopathy (PVR) of the vitreous body because of retinal open break, secondary glaucoma, cataract, macular pucker,and severe uveitis with severe neovascularization.[9,10] Proliferative vitreoretinopathy is facilitated by chronic retinal detachment and involves excessive deposition of extracellular matrix (ECM) proteins.[12] Retinal pigment epithelium cell also involved in PVR, its migration is enhanced by a PKCα agonist and suppressed by a PKCα antagonist.[13] Other cytokines reported involved as well in wound healing process is basic fibroblast growth factor. It might have protective, repairing and wound healing effects on the retina.[14] In this study, PVR and retinal open break were reported as the main causes of recurrent detachment. This might explain why there were no significant visual improvement in the 69.2% of anatomically successful attached cases.

Physical activity on pediatric patients and the inability to maintain particular position after surgery make the use of prolonged vitreous tamponade such as silicone oil highly preferred. These tamponade ease the activity of pediatric patients and the family, and to maintain patient's position. The complications of the oil must be taken into consideration such as cataract, glaucoma, cornea decompression, and resurgery to remove it.[15] But the advantage of using the oil outweighs the disadvantage in pediatric retinal detachment and will always be the first choice in pediatric giant retinal tears cases.[8] In

this study, oil was used in 69.2% cases, the others were SF620% gas. There were two cases that was done under local anesthesia, something that has not been reported in any journals so far.

Wadhwa N *et al* reported that the successful rate of primary scleral buckling in India was 83.5%, and PVR was the main cause of failure[9] Meanwhile the successful rate of the whole vitreo-retina surgery in Nepal was 74.5%.[16] They reported that 39% of patients felt there were improvement in visual acuity (VA), and 33% of patients's visual acuity were > 6/60 after surgery. Weinberg DV *et al* reported that surgical outcomes of retinal reattachment occurs in 79% eyes on pediatric rhegmatogenous retinal detachmentsis; but the vision improvement was modest. Pre surgery median visual acuity was counting fingers and after surgery was 20/400.[17] Wang NK, et al. reported that the surgical outcome of anatomically reattachment in pediatric retinal detachment in Taiwan was achieved in 72% eyes in one surgery. In this study the main cause were myopia and injury.[18] In other study, they reported retinal reattachment of retinal detachment following trauma was successful in 12 eyes (36%).[19]

In pediatric patients, when retinal detachment was accompany by vitreous hemorrhage, they were significantly having higher rates of enucleation/evisceration/exenteration at last follow-up.[20] Inflammation is a conditions which occur commonly after surgery,[21] that might progress to severe neovascularization. Silicone oil is also a trigger factor for inflammatory reaction. In this study, silicon oil evacuation was followed by severe inflammation and neovascularization, which managed by intra vitreal bevazicumab and long acting steroid. The neovascularization was reduced dramatically, though vision not improved.

Avoiding iatrogenic retinal break during vitrectomy on pediatric patients is highly recommended. Any break will result in severe proliferation that ends with recurrence of retinal detachment. There was study of RPE as a convenient source of new photoreceptor cells,[22] which damage in retinal detachment. But a strong association between RPE cells and myofibroblasts in cases of epi-retinal membrane (ERM) with or without retinal detachment indicates that RPE cells may contribute to the formation of ERM via a wound healing process.[23] This formation will be worse in pediatric retinal detachment compare to adults patient.

Growth factor in pediatric patients contribute to faster healing along with severe proliferation. This is seen as in patients with trauma,[4] post cataract surgery,[24] due to more severe inflammation. Despite improvement in endoscopic vitrectomy,[25] the result is not so promising and needs special care if it were to be done in pediatric patients.There is always risk of amblyopia after surgery. Bai H et al prescribe spectacles or implanting an intraocular lens following surgeries for cataract and vitreoretina in pediatric patients. They found that occlusion therapy, combined with wearing spectacles and implanting IOLs, is valuable in treating deprivation amblyopia in their cases.[26]

To the best of the author's knowledge there is no written report on pediatric surgery result in Indonesia so far. Total case in this study is not large, due to rarity of pediatric retinal detachment. We recommend collaborating studies between research centers.

In conclusion, retinal attachment is achieved in 69.2% cases and vision improvement is not significant statistically. Long retinal detachment and injury as a cause

are prognostic factor for poor vision improvement after surgery. The cause of recurrence retinal detachment are PVR and open break. In this study, older pediatric cases were done under the local anesthesia.

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Table 1. Demography of subjects with retinal detachment.

Age	Sex	Detachment Duration (weeks)	BCVA-1	BCVA-2	Cause	Anatomically
3	Female	8	0.01	0.2	Lensectomy	Attached
15	Male	44	0,250	0,003	Close globe injury	Detached
17	Male	6	0,003	0,050	Myopia	Attached
16	Male	12	0,033	0,083	Close globe injury	Attached
11	Male	156	0,003	0,200	Close globe injury	Detached
13	Male	104	0,083	0,083	Close globe injury	Attached
6	Female	3	0.0001	0.0001	Exudative Retinopathy	Detached
13	Male	2	0,100	0,100	Close globe injury	Attached
11	Male	72	0.01	0.25	Close globe injury	Attached
10	Female	4	0.001	0.01	Close globe injury	Attached
17	Male	2	0.01	0.5	Myopia	Attached
17	Male	2	0.001	0.001	Close globe injury	Detached
17	Male	2	0.0001	0.001	Close globe injury	Attached

BCVA-1 : best corrected visual acuity before surgery.
BCVA-2 : best corrected visual acuity after surgery

Table 2. Variables contributing to surgical outcome.

Variables	Mean or Frequency	*p*
BCVA-1 BCVA-2	0.039 ± 0.071 0.114 ± 0.144	0.146[a]
Anatomical result vs Detachment duration	< 2 weeks : 4 patients > 2 weeks : 9 patients	0.773[b]
Anatomical result vs Detachment duration	< 8 weeks: 8 patients > 8 weeks : 5 patients	0.584[b]
BCVA-2 vs Detachment duration	< 2 weeks : 4 patients X: 0.150 ± 0.238 > 2 weeks : 9 patients X: 0.098 ± 0.095	0.566[c]
BCVA-2 vs Detachment duration	< 4 weeks: 6 patients X: 0.124 ± 0.092 > 4 weeks : 5 patients X: 0.124 + 0.01	0.796[a]
BCVA-2 vs Detachment duration	< 8 weeks: 8 patients X: 0.108 ± 0.173 > 8 weeks : 5 patients X: 0.124 + 0.01	0.855[c]

[a] Paired t-test
[b] Mann-Whitney U test
[c] Independent t-test

BCVA-1 : best corrected visual acuity before surgery.
BCVA-2 : best corrected visual acuity after surgery

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