International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

Bilateral Persistent Fetal vasculature in Identical Twin Girls

Eka Sutyawan[1], I Wayan[2], M Cynthia Dewi[3]

Opthalmology Department of Udayana University, Denpasar, Bali

Abstract: ***Introduction and Objective: Persistent fetal vasculature (PFV) previously known as persistent hyperplastic primary vitreous (PHPV)is a rare congenital malformation idiopathic attributed to impaired regression of the hyaloids vascularization during the embryonic period. Most cases are sporadic and unilateral, and only 2% bilateral. The objective of this report is to show a case with bilateral persistent fetal vasculature (BPFV)in twin girls and its management. Case Description: Five years old twin girls present with difficulties while studying at school. They were born premature in 28 weeks with normal growth and development. Both were strabismus and the visual acuitywas1/60 with normal intraocular pressure in the beginning. Both segments with elevated posterior vitreous membrane from the optic nerve, retinal fold, and Bergmeister papilla. Both received observation management witheye glasses, optical and non-optical low vision aids for low vision. Conclusion: Bilateral persistent fetal vasculatureis a rare congenital malformation with variated clinical features. The management is surgery or observation depends on clinical, anatomy anomaly, and visual prognose. Children with BPFV growing niche with posterior anomaly roomates mostly related with poor visual prognostic. Bilateral persistent fetal vasculature needs of comprehensive management. Lifelong monitoring is a mandatory to avoid complications and visual rehabilitation due for daily living.***

Keywords: Persistent fetal vasculature, bilateral, twin

1. Introduction

Persistent fetal vasculature (PFV) was formerly known as *persistent hyperplastic primary vitreous* (PHPV) was first described in histopathology as embryonic regression failure by Reese in 1949. *Persistent fetalvasculature* is a rare congenital disorder, as a result of failure of the primary vitreous vascular regression (Hu et al., 2016; Li-Sheng Cheng et al., 2004). *Persistent fetal vasculature* can be categorized as anterior, posterior, or combined anterior and posterior (Farber et al., 2015; AAO Staff, 2014-2015a).

Persistent fetal vasculature is generally unilateral. The presence of a hyaloid vascular system may occur in 3% of term infants and 95% in premature infants (Kumar et al., 2010; Shah et al., 2008). Clinical manifestations include microphthalmia, progressive cataract, retrolenticular fibrovascular tissue, hyaloid vascular remnant, and vasculosa lentis tunica remnant. The severity of the failure of PFV regression can be mild or severe and require surgery for secondary complications of bleeding, glaucoma, and ptisis (Hu et al., 2016; AAO Staff, 2014-2015a; Tasman et al., 2003). PFV management can be surgical or observational. Surgery aims to provide a better visual acuity and prevent or delay the occurrence of ocular complications. The decision to perform surgery based on the severity of PFV, whether or not the fundus visible through the pupil without dilatation, with or without *retinal detachment*, and the degree of cataract (Shah et al, 2008; Tasman et al., 2003). Observational management by providing tools for the rehabilitation and repair of visus such as glasses, optical aids, and non-optical aids (AAO Staff, 2014-2015d; Kavitha et al, 2015).

This case report is describing a case with a very rare clinical manifestation of BPFV and it is hoped that this case report can improve understanding of BPFV and its management.

2. Case Report

Two five-years-old twin daughters came to eye polyclinic escorted by their parents on October 7, 2015 with complaints of blurred vision in both eyes since childhood.

Figure 1: AK1

Figure 2: AK 2

(Courtesy: M, Cynthia Dewi)

From heteroanamnesis, the blurred vision is known when the two children were in kindergarten, where they were not focused while the teacher was writing and explaining pictures on the board. Both children were born by a 31-years-old mother by cesarean section due to membrane rupture at 28 weeks gestation. There was no history of maternal illness during pregnancy. First twin (AK1) with 1400 grams of birth weight and second twin (AK2) with 1000 grams of birth weight. Their growth are normal in accordance with the development of age. AK2 had a history of shortness of breath until the age of two years. They had a complete immunization history. They are the second and third children of three, with a 13-years-old brother with a normal history of birth and growth. Since childhood, they should get special direction to reach small items, because they easier to find objects of larger size. Both parents work as tour guide. Dad is a smoker. No other family member has the same complaint as they are.

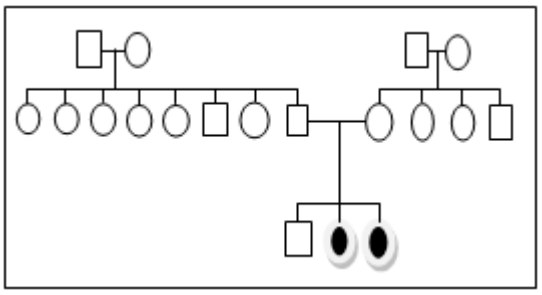

Figure 3: Family Tree *(Courtesy:* M, Cynthia Dewi)

On early ophthalmologic examination on October 7, 2015 obtained right eye vision and left eye AK1 and AK2 were 1/60 using Cardiff image because both children do not know letters and numbers. In AK1 obtained 30º exotrophia with nystagmus, normal anterior segment, and an overview of both eye fundus using indirect ophthalmoscopy with dilated pupils obtained *Bergmeister papilla, retinal fold* and *stalk.* Intraocular pressure on both eyes were 11 mmHg. In AK2 obtained 30º exotrophia, normal anterior segment, and an overview of both eye fundus using indirect ophthalmoscopy with dilated pupils obtained *Bergmeister papilla, retinal fold,stalk,* and retina tigroid. Intraocular pressure were 12 mmHg on the right eye and 11mmHg on the left eye. Both children were diagnosed with BPFV with a differential diagnosis of *retinopathy of prematurity* (ROP) *regression*and planned to consult to refractive division to have a streak retinoscopy examination.

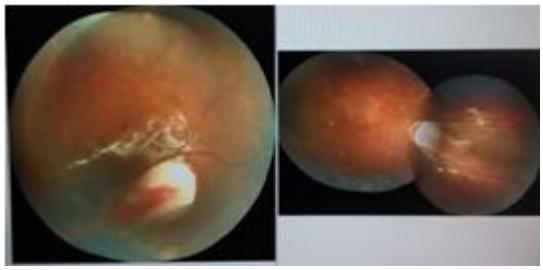

Figure 4: AK1 Fundus photograph (Courtesy: M, C ynthia D EWI)

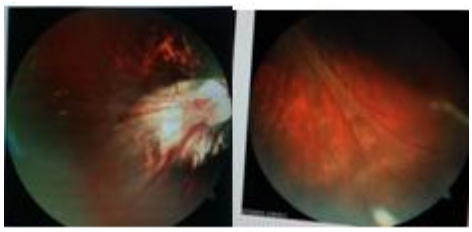

Figure 5: AK2 fundus photograph (Courtesy: M, C ynthia D EWI)

On October 17, 2015, a follow-up examination was conducted. From refractive division the autorefractor result obtained for AK1 were S-7.75 C-1.25 Ax 144 º on right eye and S-13.00 C-4.75 Ax 73 º on left eye. While for AK2 were S-13.75 C-1.75 Ax 153º on the right eye and S-16.25 C-2.75 Ax 39º on the left eye. Streak retinoscopy was performed using cyclopegic on both eyes. For AK1, obtained retinoscopic streak results with an extra fixation of fovea on the right eye of S -3.75 C-2.00 AX 180 º while the left eye was difficult to be evaluated. Subjective examination of AK1 obtained S-5.75 C-2.00 Ax 90º while left eye was difficult to be evaluated. Spectacle correction were given for the right eye S-3.75 C-2.00 Ax 180º and left eye with plano obtained 0.1 / 1 meter binocular. Whereas for AK2 we got streak retinoscopy of right eye with S-16.00 and left eye S-18.00. From AK2's subjective examination obtained right eye S-14.00 and left eye S-16.00. Correction of spectacleswere given for the right eye S-13.00 C-1.50 Ax 153º while left eye S-15.00 C-2.50 Ax 39 º obtained 0.1 / 1 meter binocular. Spectacles adaptation in both child was good, they were diagnosed with*low vision.* Management are with spectacles, optical aids such as magnifying glass, and non-optical aids such as enlarged letters, writing with large markers, and increasing contrast. The refractive division was suggesting an observation, re-evaluation of the visual acuity after using the specatcles and consultation to the vitreoretina and strabismus division. On January 30, 2016 the two children came to the eye clinic. In AK1 obtained visual acuity (VA) was 6/60 on the right eye and 5/60 on left eye using spectacles whereas on AK2 the VA on right eye was 4/60 and left eye 6/60 using spectacles. The two children were consulted to pediatrician to rule out any systemic abnormalities that may accompany BPFV. Pediatriciandid not find any systemic abnormalities in both children. On March 24, 2016 theycame for follow-up examination. AK1 VA on right eye was 5/60 and 4/60 on left eye using spectacles. AK2 VA was 4/60 on the right eye and 5/60 on the left eye using spectacles. The vitreoretina section suggested a closed observation for both children. From strabismus divison, AK1 was obtained 30º Hirschberg exotrophia, *coveruncover* examination with *non-shifting,*Krimsky test 40 PD, *jerk* nystagmus type and monocular fixation on the right eye. Twins 1 was diganosed with sensory exotrophia with nystagmus. AK2 was obtained 30º Hirschberg exotrophia, *cover*uncover examination with a *nonshifting,* Krimsky test 45 PD, and left eye fixation. Twins 2 was diagnosedwith sensory exotrophia, The management from strabismus division was only observation. The family said that the two children are very dependent on the use of spectacles. In school both children have been able to follow the learning activities. Both children were diagnosed with BPFV.

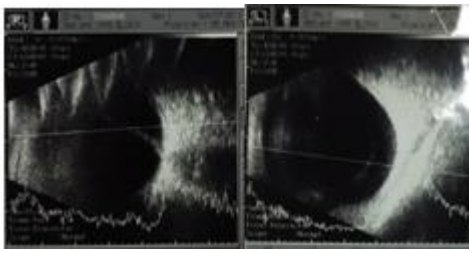

Figure 6: Ultrasound B scan AK1 *(Courtesy:* M, C ynthia D EWI)

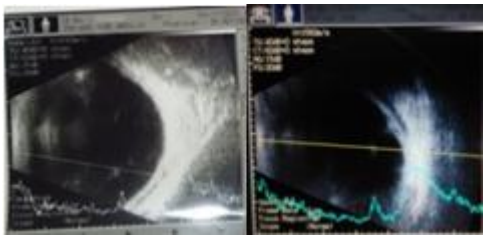

Figure 7: Ultrasound B scan AK2 *(Courtesy:* M, C ynthia D EWI)

3. Discussion

Persistent fetal vasculature is a congenital developmental disorder of the eye due to failure of hyaloid vascular and primary embryologic vitreous regression. Clinically, fibrovascular plaque may be accompanied by fibrovascular stalks in the retrolental spaces extending laterally to the ciliary process, which can be attracted centripetally by traction of fibrovascular tissue. Clinical features is ciliary process elongation. The anterior fibrovascular plaque is usually adjacent to the rest of the hyaloid artery that may be attached to the optic nerve. The involvement of the posterior structures may be broader with *tractional detachment* of the retina due to the traction of the preretinal perpapillary membrane. Lens is often murky, and non-ocular tissues such as fatty tissue and cartilage can be as retrolental mass (AAO Staff, 2014-2015a; AAO Staff, 2014-2015b; Kozeis et al., 2012; Kumar et al., 2010). *Persistent fetal vasculature* usually occurs unilaterally without systemic disorders, but BPFV may be accompanied by systemic and neurologic abnormalities (AAO Staff, 2014-2015b; AAO Staff, 2014-2015c). The incidence of PFV is very rare as in sibling relationships, non-identical female twins, or between mother and child have been reported. The etiology of PFV is still under study, where most cases are sporadic, and some dominant recessive or autosomal derivative patterns have been reported (Farber et al, 2015; Zahavi et al., 2015; Zhao et al., 2010).

Persistent fetal vasculature can occur in 3% of aterm infants and 95% in premature infants. This disorder does not develop in childhood but changes in intraocular traction can occur due to the growth of the eyeball. *Stalk* also can cause traction on the posterior lens capsule which can trigger a posterior lenticonus. Traction in the ciliary body can causeocular hypotony. Traction on the retina can cause*tractional retinal detachment* (Hu et al., 2016; Sisk et al., 2010). There are three types of PFV (Hu et al., 2016; AAO Staff, 2014-2015a; Shah et al., 2008):

1) Anterior *Persistent Fetal vasculature*
   The primary feature of this disorder is persistent anterior lenticular vascular tunic in the absence of a posterior hyaloid component. Appears at the age of 1-2 weeks of birth with leukokoria.
2) Posterior *Persistent FetalVasculature*
   The primary feature of this disorder is a persistent posterior hyaloid artery in the absence of an anterior vesiculous tunic of the lens. The clinical features such as microphthalmia (probably/none), posterior lens opacities, vitreous*stalk*, *retinal fold*,*tractional retinal detachment*, optic nerve and macular hypoplasia. *Stalk* can be entered from either the central anterior lens that includes a visual axis, or eccentric. If the *stalk*enter eccentrically, there is no change in visual acuity at a young age but strabismus can occur. If there is any visual axis turbidity, abnormalities will be found during newborn screening. Children with visual *stalk* eccentrically to the axis of strabismus usually appear at the age of 9-10 months.
3) Combination *Persistent Fetal vasculature*
   Abnormalities occur when the tunica vesiculous lentis and hyaloid system. This condition has a presentation picture that depends on the degree of involution of hyaloid and tunica vesiculous lentis. Combination type *Persistent fetal vasculature*is the most common with a complex shape, numbering around 60% of all cases.

In this case, both children were born premature at 28 weeks of gestation with normal growth. Visual impairment has been seen since younger age, where in AK1 was found a cross-eyed at the age of two years. Ophthalmology examination of both eyes of AK1 obtained a 30º exotrophia with nystagmus, 1/60 visual acuity using Cardiff cards, with a normal ocular pressure and anterior chamber, clear lens, and the fundus picture obtained *Bergmeister papilla,stalk,* and *retinal fold.* Ophthalmology examination on AK2 obtained a 30º exotrophia, 1/60 visual acuity using Cardiff cards, normal ocular pressure and anterior chamber, clear lens, and the fundus picture obtained *Bergmeister papilla,stalk,retinal fold,* and tigroid of the retina. The clinical pictures found consistent with a posterior BPFV. From the strabismus division, they were diagnosed with sensory exotrophia. Sensory exotrophia can be caused by severe conditions that decrease VA in one eye such as anisometropia, lens or corneal opacity, hypoplasia or optic atrophy, retinal lesions, or amblyopia (AAO, 2014-2015c).

The Canadian National Institute for the Blind defines *low vision* with 20/60 vision or lower and can not be corrected by spectacles or standard contact lenses.*The World HealthOrganization* (WHO) has some categories limitations ranging from mild to severe *low vision* based on the VA. A broader definition of *low vision* include vision that can not be corrected by spectacles or standard contact lenses and affect the quality of life of patients (Chavda et al., 2014). *The World Health Organization* describes a person with *low vision* as visual function disorder, even after treatment and / or standard refractive correction has <6/18 to *light perception* (LP) VA, or <10º visual field from the point of fixation (Kavitha dkk, 2015).

In this case, the AK1'sspectlacles correction on the right eye was S-3.75 C-2.00 Ax 180º and the left eye with the plano obtained a 0.1 / 1 meter binocularVA. Correction of AK2 spectacles on the right eye was S-13.00 C-1.50 Ax 153º while left eye was S-15.00 C-2.50 Ax 39º obtained visus 0.1 / 1 meter binocular. They both were diagnosed with *low vision.*

The differential diagnosis of PFV are retinoblastoma, *Norrie's disease*, congenital cataracts, *Walker-Warburg syndrome,*13 trisomy , *familial exudative vitreoretinopathy,* and *retinopathy of prematurity* (Farber et al, 2015; Shah et al., 2008). The most common way to diagnose PFV is by a direct visualization of the remaining vascular residues. Ultrasonography (USG) is helpful in diagnosing, especially with poor visualization of the posterior segment. B-scan ultrasonography may help to rule out of any mass and *retinal detachment.* Echography usually shows a shorter axis than normal eyeballs, although it can be normal in some patients. The lens is usually thin and appears to be irregular in the posterior capsule. Retrolental membranes are sometimes seen. *Stalk* can be seen extending from the posterior lens capsule to the optic disc. The stalk is often very thin and difficult to identified. In addition, *computerized tomography* (CT) scan examination with contrast can reinforce the image of a persistent fibrovaskular network. Calcification of

ultrasound B-scan or CT scan may increase alertness for possible retinoblastoma, which is a common finding that indicates malignancy and is not typically found in PFV. *Magnetic resonance imaging* (MRI) is better in distinguishing the structure and morphology of soft tissue. *Computerized tomography* and MRI scans are rarely necessary. *Fluorescein angiography* is another investigation that may describe abnormal vascular (Farber et al., 2015; Shah et al., 2008; Ming-Hui Sun et al., 2003).

In this case, cycloplegic fundus examination of the eye can be seen fibrovaskular network *(stalk)* in both eyes of the twins. B-scan ultrasound examination was performed to evaluate the posterior segment, which found the *stalk*image on both twins which in this case fourth eyeball without any mass or calcification. MRI and CT scan were not being performed. In both children there were no systemic abnormalities or any other organ system abnormalities.

PFV management can be in the form of surgery or observation. Anterior *Persistent fetal vasculature* usually observation, lensectomi and management of glaucoma, either drugs or surgery. Posterior *Persistent fetal vasculature* posterior usually associated with a poor vision end result due to abnormalities of the optic nerve and retina (Farber et al., 2015). The decision in performing surgery depends on the severity. Early surgical intervention is recommended to clear the visual axis and preserve the eyeball on PFV complicated by progressive *retinal detachment,*angle closure glaucoma, and recurrent intraocular hemorrhage (Vasavada et al., 2012; Tasman et al., 2003). Specific surgical indications include the shallow anterior chamber, cloudy lens, the traction of the ciliary process, as well as the complications of glaucoma and bleeding. The benefits of surgery is to improve VA and prevent or delay the occurrence of ocular complications. The results of VA after PFV surgery may vary depends on the severity of PFV. Patients with only anterior PFV are usually have potentially good VA, whereas the VA potential of patients with posterior PFV is usually limited in the presence of optic nerve and retinal abnormalities. Vitrectomy and removal of the Hyaloid *stalk*in posterior PFV may release traction in the retina that may cause restriction of the eyeball growth or ciliary body traction, thus triggering hypothoni and ptisis bulbi (Zahavi et al., 2015; Vasavada et al., 2012). Severe *persistent fetal vasculature* require an enucleation surgery for secondary complications such as bleeding, glaucoma, and ptisis (AAO Staff, 2014-2015b; Li-Sheng Cheng et al., 2004). Age at diagnosis of PFV and surgical intervention related to the VA outcome. Recent studies have reported improvements in outcomes in PFV surgical interventions, possibly due to earlier diagnosis, more selective in choosing cases for surgery, improvement of surgical techniques, and aggressive postoperative amblyopia therapy (Vasavada et al., 2012; Kumar et al., 2010).

Conservative treatment of PFV is less frequently done than surgery. *Mild persistent fetal vasculature with bergmeisterpapilla andMittendorf dot* do not require any surgical intervention. In patients with severe microphthalmia or posterior PFV in advance stages, such as with fovea hypoplasia, dysplasia, or *retinal detachment* then surgery is not effective. Children with BPFV are more likely with posterior abnormalities, which are usually associated with a poor VA prognosis (Kumar et al. 2010; Zhao et al., 2010). In mild PFV, surgery is not required if the visual axis is clear, anatomical abnormalities are not progressive, and the anterior chamber angle does not close. Glaucoma, *retinal detachment*, and especially amblyopia contribute to poor VA outcome. Refractive correction and amblyopia therapy are essential for visual rehabilitation. Overall, PFV requires a careful handling and *follow-up*including*pediatric ophthalmologists,* vitreoretina surgeons and refractive expert (AAO Staff, 2014-2015c; AAO Staff, 2014-2015d; Zhao et al., 2010). Visual rehabilitation is recommended if decreased VA affects his/her ability in visual tasks. Ophthalmologist have an important role in recommending children with *low vision* to get a comprehensive visual rehabilitation (AAO Staff, 2014-2015c).

In this case, an observative treatment was performed because the posterior BPFV was accompanied by retinal and bergmeinster papilla, and there was no lens opacification, closed angled, or any secondary complications. Management has been done in this case was refractive correction and *low vision* aids.

Children's needs at home and non-academic places need to be well considered. The various tools needed to help patients with decreased VA, ranging from spectacles, contact lenses, optical and non-optical aids. It is important to consider any minor refractive abnormalities in children with decreased VA. Children with decreased VA may have a high refractive abnormalities and require consideration of the choice of tools to ensure that they are appropriate for their intended purpose. There are a variety of optical aids such as magnifying glasses, high-addition spectacles and telescopes available to help patients with decreased VA. The magnifying glass is the most simple low vision aid. The strength of the magnifying glass from low to medium enables the patient with a mild to moderate decrease in vision to read a long text. Telescopes are needed for jobs that require a distance view especially in elderly patients. High-addition spectacles is an option for patients who need to adapt to close-up work (AAO Staff, 2014-2015d; Chadha and Rudduck, 2011).

Non-optical aids are tools other than optical instruments for patients with visual impairments. This tool is an electronic device such as a video camera with the screen, wide screen monitor, *global positioning system* (GPS), telephone, large size clock facilitates individuals with severe *lowvision*. Electronic devices in the form of video cameras combined with the screen are also available in various formats that allow for varying magnification, more convenient reading position, and contrast setting available on optical magnifiers. Other non-visual aids such as tactile aids, Braille letters, hearing aids, thick black ink pens, dark-lined papers are also helpful (AAO Staff, 2014-2015d; Chadha and Rudduck, 2011).

In this case, both children are taught to get used to wearing spectacles so that they are helped in their daily activities. Families are given knowledge about the eye condition experienced by their two children, so the family can support the development of children with a limited VA. Visual rehabilitation and improvement is done by teaching the

family about the use of optical and non-optical aids such as the use of a magnifying glass if the child wants to see small prints, write in capital and bold letters, increasing the contrast of color. In addition, at school children are placed in the front seat to make it easier to see the writing on the board. Both children are now able to attend school lessons as their classmates. They are still advised to control the eye policlinic to evaluate the VA, eye conditions, and prevent secondary complications that can occur.

4. Conclusion

Bilateral persistent fetal vasculature is a very rare congenital malformation which occurs with varying clinical picture. Determination of management in the form of surgery or observation depends on the clinical picture, anatomical abnormalities, and visual prognosis. *Bilateral persistent fetal vasculature* abnormalities tend to be posterior, which is usually related to a poor prognosis of visual acuity. *Bilateral persistent fetal vasculature* requires a comprehensive management and long-term *follow-up* to prevent complications, vision rehabilitation, and improves the quality of life.

References

[1] American Academy of Ophthalmology.2014-2015a. *Diseases of Vitreous and Vitreoretinal Interface.* Dalam: Retina and Vitreous. BCSC section 12. San Fransisco: AAO. h.297-314
[2] American Academy of Ophthalmology.2014-2015b. *Vitreous.* Dalam: Ophthalmic Pathology and Intraocular Tumors. BCSC section 4. San Fransisco: AAO. h.131-40
[3] American Academy of Ophthalmology.2014-2015c. *Disorders of the Retina and vitreous.* Dalam: Pediatric Ophthalmology and Strabismus. BCSC section 6. San Fransisco: AAO. h.321-49
[4] American Academy of Ophthalmology.2014-2015d. *Optical Instruments and Low Vision Aids.* Dalam: Clinical Optics. BCSC section 3. San Fransisco: AAO. h.237-73
[5] Chanda R dan Rudduck G. 2011. *Paediatric Low Vision.* Tersedia dari URL: http://www.opticianonline.net
[6] Chavda S, Hodge W, Si F, dkk. 2014. *Low-Vision Rehabilitation Methods in Children: A Systematic Review.* Can J Ophthalmol. Vol.49(3)
[7] Cheng LS, Kuo HK, Lin SA, dkk. 2004. *Surgical Results of Persistent Fetal Vasculature.* Chang Gung Med J. Vol.27(8). h. 602-08
[8] Farber NC dan Shrier EM. 2015. *How to Treat Persistent Fetal Vasculature.* Dalam: Review of Ophthalmology
[9] Gulati N, Eagle RC, Tasman W. 2003. *Unoperated Eyes with Persistent Fetal Vasculature*. Trans Am Ophthalmol Soc. Vol. 101. h. 59-66
[10] Hu A, Pei X, Ding X, dkk. 2016. *Combined Persistent Fetal Vasculature*. Ophthalmology.Vol. 123(1).h. 19-25
[11] Kavitha V, Manumali MS, Praveen K, dkk. 2015. *Low vision aid- A ray of hope for irreversible visual loss in the pediatric age group.* Taiwan Journal of Ophthalmology.Vol. 5.h. 63-67
[12] Kozeis N, Tsaousis KT, Gidaris D. 2011. *Surgical Treatment of Persistent Fetal Vasculature and Visual Rehabilitation: One-Year Follow up*. Vol. 2012. Dalam: Hindawi Publishing Corporation Case Reports in Medicine. Article ID 687081
[13] Kumar A, Jethani J, Shetty S, dkk. 2010. *Bilateral Persistent Fetal Vasculature: A Study of 11 Cases.* Journal of AAPOS. Vol. 14(4).h. 345-48
[14] Shah PK, Narendran V, Kalpana N. 2008. *Persistent Fetal Vasculature Syndrome.*Tersedia dari: URL: http://www.eJournalofOphthalmology.com
[15] Sisk RA, Berrocal AM, Feuer WJ, dkk. 2010. *Visual and Anatomic Outcomes With or Without Surgery in Persistent Fetal Vasculature.* Ophthalmology.Vol. 117.h. 2178-83
[16] Sun MH, Kao LY, Kuo YH. 2003. *Persistent Hyperplastic Primary Vitreous: Magnetic Resonance Imaging and Clinical Findings.*Chang Gung Med J. Vol.26(4).h. 269-76
[17] Vasavada AR, Vasavada SA, Bobrova N, dkk. 2012. *Outcomes of Pediatric Cataract Sugery in Anterior Persistent Fetal Vasculature*. J Cataract Refract Surg.Vol.38. h. 849-57
[18] Zahavi A, Hilely A, Weinberger D, dkk. 2015. *Unusual Persistent Fetal Vasculature Presentation in A Premature Baby.*Adv Pediatr Res. Vol.2(26). h. 1-4
[19] Zhao YE, Chen D, Li JH. 2010. *Bilateral Persistent Fetal Vasculature in an Adult: Clinical Manifestations and Surgical Outcomes*. J Cataract Refract Surg.Vol.36. h. 1421-26