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OPIS PRZYPADKU
CASE REPORT

Treatment of hemorrhagic retinal detachment additionally complicated by vitreous hemorrhage in a patient with end-stage renal failure

Leczenie krwotocznego odwarstwienia siatkówki dodatkowo powikłanego krwotokiem do ciała szklistego u pacjenta ze schyłkową niewydolnością nerek

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ABSTRACT

INTRODUCTION: End-stage renal disease (ESRD) is thought to be the cause of a number of retinal conditions such as retinal vein thrombosis, retinal artery occlusion, age-related macular degeneration or serous retinal detachment. ESRD is more often observed in adults than in children. Exudative or hemorrhagic retinal detachment is the pathological separation of the neurosensory retina from the pigment epithelium through the accumulation of exudative fluid and/or blood between them. Subretinal hemorrhage (SRH) then occurs, resulting in hemorrhagic retinal detachment.
CASE REPORT: A 73-year-old woman presented with sudden visual impairment in the right eye. She has been on hemodialysis three times a week for four years due to ESRD. Visual acuity testing showed light perception in the right eye and 5/16 in the left eye. The intraocular pressure was 15 mmHg in the right eye and 18 mmHg in the left eye. An ultrasound of the right eye revealed hemorrhagic retinal detachment with hemorrhage into the vitreous chamber. The patient was qualified for pars plana vitrectomy. A pars plana vitrectomy procedure was performed with subretinal blood removal, retinal laser therapy and silicone oil endotamponade of the right eye. In the postoperative period, in the examination follow-up, visual acuity in the right eye was achieved at the level of hand movements in front of the eye, and intraocular pressure at 13 mmHg.
CONCLUSIONS: Pars plana vitrectomy with silicone oil administration proved to be an effective treatment for this patient. Improvement and stabilization of the local condition was achieved.

KEYWORDS

vitrectomy, retinal detachment, subretinal hemorrhage, vitreous hemorrhage, technical note

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STRESZCZENIE

WPROWADZENIE: Schyłkową niewydolność nerek (*end-stage renal disease* – ESRD) uważa się za przyczynę wielu schorzeń siatkówki, takich jak zakrzep żyły siatkówki, zator tętnicy siatkówki, zwyrodnienie plamki związane z wiekiem czy surowicze odwarstwienie siatkówki. ESRD częściej jest obserwowana u osób dorosłych niż u dzieci. Surowicze czy krwotoczne odwarstwienie siatkówki to patologiczne oddzielenie siatkówki neurosensorycznej od nabłonka barwnikowego poprzez gromadzący się między nimi płyn wysiękowy i/lub krew. Dochodzi wtedy do krwotoku podsiatkówkowego (*subretinal hemorrhage* – SRH), który powoduje krwotoczne odwarstwienie siatkówki.
OPIS PRZYPADKU: 73-letnia pacjentka zgłosiła się z nagłymi zaburzeniami widzenia w oku prawym. Od czterech lat dializowana trzy razy w tygodniu z powodu ESRD. Badanie ostrości wzroku wykazało poczucie światła w oku prawym i 5/16 w oku lewym. Ciśnienie wewnątrzgałkowe wynosiło 15 mmHg w oku prawym i 18 mmHg w oku lewym. W badaniu ultrasonograficznym oka prawego wykazano krwotoczne odwarstwienie siatkówki z krwotokiem do komory ciała szklistego. Pacjentka została zakwalifikowana do witrektomii z dostępu tylnego. Wykonano witrektomię tylną z usunięciem krwi podsiatkówkowej, laseroterapią siatkówki oraz endotamponadą olejem silikonowym oka prawego. W okresie pooperacyjnym w badaniu kontrolnym uzyskano ostrość wzroku w oku prawym na poziomie ruchów ręki przed okiem oraz ciśnienie wewnątrzgałkowe na poziomie 13 mmHg.
WNIOSKI: Witrektomia z dostępu tylnego z podaniem oleju silikonowego w przypadku krwotocznego odwarstwienia siatkówki jest skuteczną metodą leczenia, dającą szansę na poprawę stanu miejscowego i zachowanie użytecznej ostrości wzroku.

SŁOWA KLUCZOWE

witrektomia, odwarstwienie siatkówki, krwotok podsiatkówkowy, krwotok do ciała szklistego, opis techniki operacyjnej

INTRODUCTION

End-stage renal disease (ESRD), is thought to cause a number of retinal conditions such as retinal vein thrombosis, retinal artery occlusion, age-related macular degeneration or serous retinal detachment [1,2,3,4]. ESRD is more often seen in adults than in children [5]. Exudative or hemorrhagic retinal detachment is the pathological separation of the neurosensory retina from the pigment epithelium through the accumulation of exudative fluid and/or blood between them [6,7]. Such pathology may be related to chronic renal failure as previously described. Blood in this space comes from the choroidal and/or retinal circulation [8]. Subretinal hemorrhage (SRH) then occurs, resulting in hemorrhagic retinal detachment [8]. In very rare cases, SRH can occur, also leading to hemorrhagic retinal detachment. An additional complication that can accompany SRH is hemorrhage into the vitreous body (vitreous hemorrhage – VH). This occurs because SRH infiltrates and punctures the retina in VH [9]. This is a situation that puts the patient in direct threat of permanent vision loss.

CASE REPORT

A 73-year-old woman presented with sudden visual impairment in the right eye. The patient suffers from hypertension, lower limb atherosclerosis, dyslipidemia, hepatic steatosis, chronic obstructive pulmonary disease and diabetes. She has been on dialysis three times a week for 4 years due to ESRD, creatinine level 4.11 mg/dl. The patient underwent left breast cancer 23 years ago, treated with a radical unilateral mastectomy, radiation therapy and chemotherapy. She takes amlodipine 5 mg, atorvastatin 10 mg, pentoxifylline and acetylsalicylic acid 75 mg on a daily basis. A visual acuity test showed light perception in the right eye and 5/16 in the left eye. The intraocular pressure was 15 mmHg in the right eye and 18 mmHg in the left eye. An ultrasound examination of the eyeball in the A projection of the right eye was performed; the image could correspond to VH and SRH, but a proliferative process could not be excluded either (Figure 1).

Fig. 1. Ultrasound showing an irregular outline of fundus of the eye and dense extra echoes in vitreous chamber.

On the basis of the patient's clinical picture, the diagnosis of an intraocular tumor that bleeds into the vitreous chamber was initiated. Consultation at the Ophthalmic Oncology Clinic was ordered. During the

consultation, ultrasound of the right eye (Figure 2) showed no malignant intraocular tumor. The lesion was most likely post-hemorrhagic in nature.

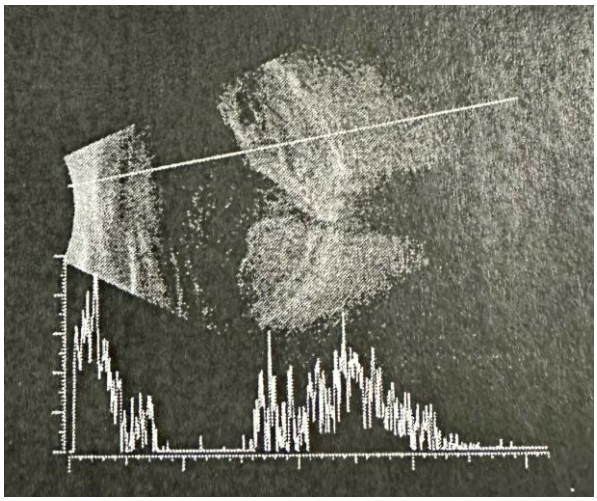

Fig. 2. Ultrasound examination, image corresponding to hemorrhagic retinal detachment.

The possibility of an intraocular tumor was excluded and hemorrhagic retinal detachment with hemorrhage into the vitreous chamber was diagnosed.

The patient was referred to the Adult Ophthalmology Department, where she was admitted on an elective basis after 21 days. On admission, her blood pressure was 141/92 mmHg and her heart rate was 113 beats per minute. Visual acuity testing showed light perception in the right eye and 5/16 in the left eye. The intraocular pressure was 16 mmHg in the right eye and 18 mmHg in the left eye. Routine laboratory tests were ordered; the blood test showed decreased levels of white blood count (3,85 × 10^3/μL) and platelets (3,38 × 10^3/μL) while there was an increased level of the mean corpuscular volume of 116.3 fL, and the mean corpuscular hemoglobin was 39.3 pg. The fasting blood glucose concentration was 129.8 mg/dL, creatinine was 4.11 mg/dL, the glomerular filtration rate was 11.21 ml/min. The coagulation panel and liver function panel were completely normal.

The patient was qualified for an emergency pars plana vitrectomy with (23G) of the right eye. The patient was anesthetized by periocular injection (2% lignocaine solution and 0.5% bupivacaine solution in a 1:1 ratio). After excision of the vitreous body, simultaneous injection of perfluorocarbon liquid into the vitreous chamber with drainage of the subretinal space by means of an additionally placed trocar and retinal incision. There was no need for a recombinant tissue plasminogen activator as the blood was noncoagulated (the medical history stated that the hemorrhage was only several weeks old) and was easily evacuated. After obtaining full-thickness retinal attachment across its entire surface, using aforementioned technique, laser therapy was performed on the peripheral retina. The perfluorocarbon liquid and the tamponade with 1000 cSt silicone oil were removed. Stage 1 of the surgical treatment was completed (Figure 3).

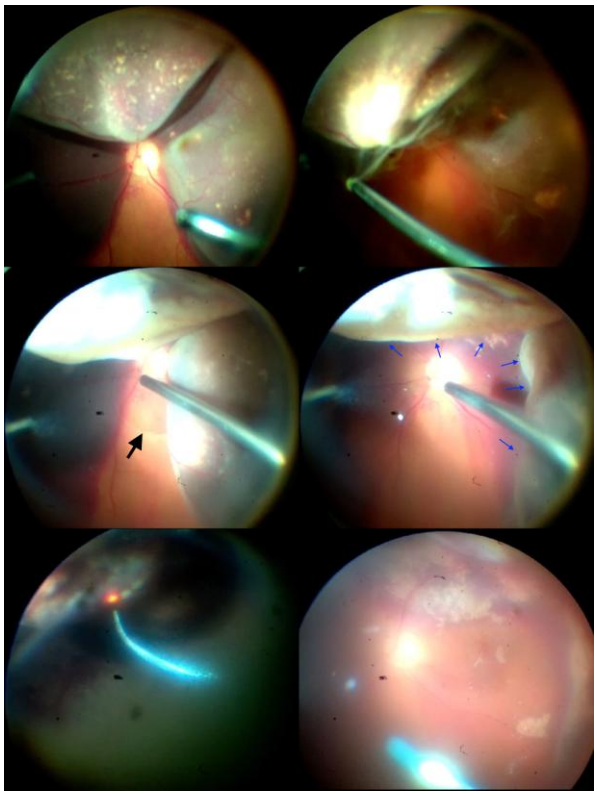

Fig. 3. Stages of pars plana vitrectomy (23G) of right eye; black arrow – administration of perfluorocarbon liquid, blue arrows – application of retina.

DISCUSSION

A complication that can correspond with SRH is VH. This occurs because SRH infiltrates and punctures the retina in VH [9]. Substances formed in the blood clotting process during SRH can cause mechanical damage to the outer retina layers and interfere with oxygen and nutrient transport. Fibrin, iron and hemosiderin present in the clot show direct toxic effects on the retina and choroidal capillaries. Indirect evidence of this phenomenon is the fact that experimentally induced SRH in rabbits causes necrosis of the retina, with erythrocytes moving into the vitreous body cavity through the necrotic area. VH occurs within a few weeks after SRH, and retinal ruptures do not occur in most cases. Hemorrhage into the vitreous body usually presents as an old immobilized hemorrhage, suggesting that erythrocytes are moving into the vitreous body cavity from the existing SRH. This toxicity begins 7 days after the hemorrhage, and the damage is irreversible after 3 weeks. Therefore, removal of the hemorrhage is critical to ensure the best

functional prognosis. This evidence underscores the importance of a quick diagnosis process and minimizing delay in surgical intervention in hemorrhagic retinal detachment [9]. In our case, the delay in surgical intervention was due to the fact that the clinical picture initially raised the suspicion of an intraocular tumor bleeding into the vitreous chamber. After ruling out a proliferative process in the eye, the decision was made to attempt surgical reattachment of the retina. Although the procedure was performed late (21 days after the patient reported to the hospital), inconsistent with data on retinal survival after hemorrhage, in this case the surgical outcome looks promising, even after such a long period of toxic effect on the retina. The patient's visual acuity in the operated eye improved from light perception to the recognition of hand movements in a follow-up examination one month after the intervention.

Tumor metastases are the most common intraocular tumors in adults, among which breast and lung adenocarcinoma are the most common in women and men alike [10,11]. These metastases can be the direct cause of exudative retinal detachment (ERD), but cases in which ERD occurred without the presence of secondary tumor foci have been described [12,13]. The pathogenesis of ERD is based on disturbances in the physiology of the cells that build the blood-retinal barrier due to an inadequate blood supply, resulting in chronic hypoxia. This can result from a variety of diseases, usually systemic, including chronic inflammation, infection, vascular malformations, degenerative conditions or cancer [12]. The disorder can result from the dysfunction of blood-retinal barrier cells owing to the mere presence of cancer cells in the blood, eventually resulting in disruption of their function and leakage of fluid into the subretinal space. The patient developed cancer of the left breast in 2001, which required treatment with a left radical mastectomy, radiation therapy and chemotherapy. Despite the passing of a long period of time since the disease and treatment, we cannot fully exclude the presence of a few cancer cells in the bloodstream. Therefore, their presence can be suspected as one of the potential causes of ERD in the described clinical case.

The mechanism described above underscores the deleterious effect of systemic diseases themselves, which can cause ERD. Of the patient's many conditions, ESRD (she has been on dialysis for 4 years with a creatinine level of 4.11 mg/dl) and high blood pressure appear to be the most worrisome. ESRD and high blood pressure result in vasoconstriction in the ocular arteries, leading to choroidal ischemia and hypertensive choroidopathy. There is also damage to the blood-retinal barrier cells, which leads to exudates in the space between the neurosensory retina and the retinal pigment epithelium, hence ERD [14]. According to Gass [15], ESRD plays a key role in the pathomechanism of ERD. Because the fibrin exudates were located below the margins of the detached pigment epithelium and the surrounding subretinal space, he hypothesized that large molecules such as fibrinogen could enter the subretinal space. This is associated with a focal increase in the permeability of the choriocapillaries in the uremic state and causes ESRD [15]. Troiano and Buccianti [16] suggested that there is a greater importance of dialysis in the pathomechanism of ERD, which causes changes in osmolarity and induces a shift of fluid between different compartments through membranes with different permeabilities. Therefore, fluid below the pigment epithelium or the subretinal space surrounding the detached pigment epithelium causes detachment in later stages and eventually ERD. A cohort study showed that the incidence of ERD in ESRD patients undergoing dialysis was 3.39 times higher than in control subjects [4]. These findings may be related to changes in choriocapillary permeability as a consequence of dialysis-induced changes in osmolarity and fluid shifts. It was also observed that patients undergoing peritoneal dialysis had a higher percentage of ERD than hemodialysis patients. Dialysis therapy is associated with the presence of chronic inflammation in the body, which is consistent with the pathomechanism of ERD. In the case of peritoneal dialysis, an additional factor causing inflammation is prolonged peritoneal glucose loading, leading to fluid accumulation due to cumulative peritoneal membrane damage and increased peritoneal membrane permeability [4]. The causes described above, by various mechanisms, damage both the blood-peritoneal barrier cells and the vessels themselves. As a result of such impaired choroidal and retinal circulation, the patient may have suffered vascular rupture as well as active subretinal and subchoroidal hemorrhage, which, combined with exudative fluid or blood, caused exudative or hemorrhagic retinal detachment.

CONCLUSIONS

Pars plana vitrectomy with silicone oil administration proved to be an effective treatment for this patient. Improvement and stabilization of the local condition was achieved.

Conflict of interest

All the authors declare that they have no conflicts of interest.

Authors' contribution

Study design – M. Guzikowski, S. Sirek, W. Rokicki
Manuscript preparation – M. Guzikowski, S. Sirek
Literature research – M. Guzikowski, S. Sirek
Final approval of the version to be published – W. Rokicki

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