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Intravitreal sustained-release ganciclovir implants for severe bilateral cytomegalovirus retinitis after stem cell transplantation

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ABSTRACT.

Purpose: To describe the treatment of cytomegalovirus (CMV) retinitis with intravitreal sustain-release ganciclovir devices in a 16-year-old patient in third remission of acute lymphoblastic leukemia after stem cell transplantation.

Methods: The patient received a stem cell transplant from an unrelated bone marrow donor after which he contracted a serious CMV infection manifested in the lungs and retinae. His immune system at this time was almost completely depleted. Implantation of a sustained-release ganciclovir device was performed in both eyes when retinitis progressed in spite of aggressive antiviral intravenous treatment.

Results: No per- or postoperative complications were noted. Infiltrates, hemorrhages and macular edema present preoperatively dissolved over a period of six months. The final visual acuity was 1.0 in both eyes. The patients immune system and lung function slowly recovered during the same time period.

Conclusions: The intravitreal ganciclovir implant provides safe and effective therapy against CMV retinitis, and should be considered in patients acquiring the infection after stem cell transplantation.

Key words: acute lymphoblastic leukemia (ALL) – bone marrow transplant (BMT) – immune reconstitution – immunosuppression – stem cell transplantation (SCT) – vitreoretinal surgery.
Fig. 1. Fundus appearance after implantation of intravitreal sustained-release ganciclovir implants. (A and B) Five days after implantation. In the right (A) and left (B) fundi, multiple hemorrhages and whitish infiltrates can be seen in all quadrants. Macular edema is present in both eyes. The visual acuity (VA) is 0.04 in the right and 0.3 in the left eye. (C and D) Two months after implantation. One hemorrhage is still present in the right eye (→), but none can be found in the left eye. No infiltrates are present, but a macular edema is evident in both eyes. The VA is 0.6 in the right and 0.9 in the left eye. (E and F) Six months after implantation. No hemorrhages, infiltrates or macular edema can be seen. Minimal retinal atrophies in the right eye (→) is the only remaining sign of the CMV retinitis. The VA is 1.0 in both eyes.
tient deteriorated, and he became oxygen dependent. Ciclosporine-A immunosuppression was discontinued three months after transplantation with no occurrence of GvHD. Thoracoscopic lung biopsy one month later showed a morphology of heavy viral pneumonia resembling obliterative bronchiolitis. The cause was identified by immunohistochemistry as a coinfection of CMV and Influenza A virus.

The patient now started to complain of dim vision and VA had fallen to 0.4 in both eyes. CMV retinitis was diagnosed, with both eyes displaying multiple whitish retinal infiltrates and hemorrhages as well as low grade macular edema. Treatment was intensified to include both ganciclovir and foscamet intravenously, but the retinitis progressed with more infiltrates, hemorrhages and increasing exudative lesions in both maculae. To save the retinae, intravitreal injections of ganciclovir according to the protocol developed by Young et al. (1998) was started in both eyes, five months after the stem cell transplant. The patient was completely immune depleted at this time judged by CD4 count 0.08 x 10E9/L (normal value is 0.5–1.6 x 10E9/L) and markedly low T cell reactivity measured by phytohemaggulutin (PHA) stimulation test. The deteriorating state of the patient and the need for general anesthesis to perform the procedure, made planning of the required weekly intravitreal injections difficult. Instead a sustained-release ganciclovir device was implanted in each eye.

The implantation procedure was, with a few exceptions, identical to the one described by Sanborn et al. (1992). The patient was put under general anesthesiA. The ganciclovir containing device (Vitratome of treatments is the sustained-release intravitreal ganciclovir implant which has been successfully used in AIDS patients (Sanborn et al. 1992; Martin et al. 1994). Reported complications of the operation include endophthalmitis, extrusion of the implant, retinal detachment, vitreous hemorrhage and placement of the implant in the suprachoroidal space (Sanborn et al. 1992; Anand et al. 1993). We found the implant procedure fairly simple to perform, and did not experience any per- or postoperative complications during the six-month follow-up in the patient reported here.

Intravitreal administration of ganciclovir is a treatment for CMV retinitis only, and cannot be given as single therapy when systemic infection is present. On the other hand intravitreal ganciclovir is more efficient in treating CMV retinitis than intravenous (i.v.) administration of the drug (Young et al. 1998), which is well illustrated in our patient who received both foscamet and ganciclovir i.v., but still progressed in his retinitis. Additionally, local ganciclovir therapy minimizes the hazardous side-effects of i.v. ganciclovir (bone marrow suppression) and foscamet (nephrotoxicity), and has shown very little, if any, adverse effects on the ocular tissues (Charles & Steiner 1996; Young et al. 1998). The sustained-release device remains active for six to seven months, after which time it can be replaced or supplemented by a second device at a different operation site if sustained therapy is required (Morley et al. 1995).

Reports on the implant being used in patients suffering from CMV retinitis after bone marrow transplant are few and include only the adult population (McAuliffe et al. 1997). To our knowledge the present case represents the first pediatric patient treated with the ganciclovir implant after stem cell transplantation.

Cytomegalovirus infection in the immunosuppressed patient represents a reactivation of a latent primary infection. When and if immune competence is regained, the virus is controlled and the CMV virus returns to its previously latent stage. A reconstitution of the immune system is thus of utmost importance in any immunosuppressed patient displaying signs of active CMV infection.

Our patient was CMV positive at the time of his stem cell transplant but the donor was not. As a consequence, no immunologic memory was established in the donor immune system and the CMV infection was reactivated since the patients own immune cells were obliterated by the conditioning and postgrafting immunosuppressive treatment. The very slow reconstitution of the immune system in spite of the early discontinuation of im-

Discussion

The introduction of ganciclovir and foscamet has radically changed the poor prognosis of CMV retinitis. One of the more recent additions to the armamentarium of treatments is the sustained-release intravitreal ganciclovir implant which has been successfully used in AIDS patients (Sanborn et al. 1992; Martin et al. 1994). Reported complications of the operation include endophthalmitis,
munosuppressive therapy allowed the CMV to ravage systemically, in the lungs and retinas. Antiviral therapy under such conditions is directed at stopping the progress of the disease until immunological reconstitution is achieved. The rapid improvement of the CMV retinitis of our patient suggests that the intravitreal ganciclovir implant controlled the CMV retinitis directly, but the long duration of the sustained-release preparation also gave the patient enough time to reconstitute his new immune system, without irreversible damage to the retina.

To summarize, we have illustrated that the intravitreal sustained-release ganciclovir device can be effective in treating CMV retinitis in a severely immunosuppressed patient. We suggest that the device should be considered not only in adult patients suffering from AIDS but also in young patients with CMV retinitis after stem cell transplantation.

References


