Recommendations for post-adaption care of an ocular prosthesis: A review.

Sergio Bonaque-González[a,b,*], Alfredo Amigó[a], Cecilia Rodríguez-Luna[a]

[a] Instituto Oftalmológico Amigó, Santa Cruz de Tenerife, Spain
[b] Departamento de Física, University of La Laguna, Santa Cruz de Tenerife, Spain

ABSTRACT

An ocular prosthesis must be maintained in a suitable state of cleanliness, fit and preservation. Otherwise its functioning may be compromised, leading to a variety of diseases. However, there is a lack of consensus on the care of such prostheses. This review assembles and attempts to update existing knowledge in this area and discusses the most appropriate care regimes.

© 2015 British Contact Lens Association. Published by Elsevier Ltd. All rights reserved.

Contents

1. Introduction

The ocular prosthesis, also known as 'prosthetic eye' or 'artificial eye', is a device that occupies the anterior part of an anophthalmic socket and is designed to restore a lost eye due to trauma, congenital anomaly, irreparable damage, tumors or sympathetic ophthalmia, among others [1]. These aids are normally situated in the anophthalmic socket, which must be

* Corresponding author at: Instituto Oftalmológico Amigó, C/ Bravo Murillo 10, Santa Cruz de Tenerife 38003, Islas Canarias, Spain.
  E-mail address: sergio.bonaque@um.es (S. Bonaque-González).

calm, healthy and dimensionally stable with any remaining sutures having been reabsorbed or fallen away. The best time for fitting an artificial eye varies from person to person, but over 8 weeks after surgery is generally accepted [2,3]. Early applications have however been reported with good results [4].

An ocular prosthesis may be available readymade (stock ocular prosthesis) or can be custom made. Stock prostheses come in standard sizes, shapes, and colors. They can be used for interim or postoperative purposes [5]. Custom-made eyes have several advantages: better mobility, more even pressure distribution (thereby reducing the incidence of ulceration), improved fit, comfort adaptation, facial contours, and enhanced aesthetics gained from the control over the size of the iris, pupil, and color of the iris and sclera [6].

Ocular prostheses meet an aesthetic or cosmetic need but are also functional in that their presence prevents possible complications like ulcers, infections, tissue retraction, severe orbital defects, and also the fallen eyebrows, eyelids and forehead that can occur in cavities without eyeballs [7–9]. They also restore lachrymal dynamics and help the tear-glands partially recover their natural position [7].

However, these alterations may occur in any case if the prosthesis is unsuitable for the size of the orbit, in poor condition, or is not custom-made from an impression of the cavity [9]. The ideal ocular prosthesis is therefore a beneficial element, which must be correctly fitted to the cavity and maintained in an excellent state of preservation [7–9].

However, there is currently no general agreement on the precise care needs for prosthetic eyes in terms of cleanliness, handling and their useful life [10]; this is reflected in the evident shortage of publications on these aspects. This review summarizes articles published in standard scientific databases up to August 2014. The intention is to provide an update of existing knowledge and propose guidelines for the most suitable care of a prosthetic eye.

2. Evaluation of the ocular prosthesis

The whole surface of the prosthesis must be free of irregularities, roughness, marks and scratches, and be perfectly polished; otherwise it may cause discomfort and be more prone to deterioration and bacterial deposits [11,12]. Jones and Collin [12] classified causes of discharge, and examined eight patients with discharge using a method based on their classification. They reported that mechanical irritation from prosthetic eyes with scratches or chips was a cause of chronic discharge with recurrent symptoms not responding to topical antibiotics.

The prosthesis should therefore be examined in each visit. There may be abnormalities of the conjunctiva or cavity in general, damaged areas, deposits, irregularities or color dimming in a particular area. Where possible, repair then becomes necessary, or otherwise a new prosthesis [9,11–13]. If the artificial eye was not prepared from an impression of the cavity, the patient should be encouraged to replace it with a custom-made one, in order to avoid possible future complications [9].

3. Longevity of the ocular prosthesis

Over the years, the cavity and surrounding tissues may change so that the ocular prosthesis no longer fits well; this can induce tissue hyperplasia [9]. Furthermore, the material of the prosthesis becomes more porous, encouraging bacterial growth, increased secretion, a 'foreign-body' sensation and discomfort. Ultimately, these factors favor the onset of chronic conjunctivitis [14–16] and so it is clear that an ocular prosthesis does not have an eternal useful life. Although there are no specific articles addressing this issue in the scientific literature, there seems to be general agreement that the life-time of a prosthetic eye is between 2 and 6 years in an adult, depending on the patient's age, occupation, care of the prosthesis and its constituent materials [16,17].

Due to the fact that all patients are different, regular yearly checkups are very important to review the fit and condition of the prosthesis. If these are found to be unsatisfactory, there are variations in morphology or orbit volume, or the aesthetic appearance is not optimal, then replacement is the correct course of action [17–19].

3.1. Longevity of the ocular prosthesis in children

Patients in early childhood are special cases. A study by Yago and Furuta [20] evaluated orbital growth after unilateral enucleation in infancy using computed X-ray tomography images. They demonstrated that socket expansion and regular replacements of the prosthesis are important for normal growth of the anophthalmic orbit in children, since it becomes progressively too small in relation to the orbit. In this context, Raizada et al. [21] analysed how many replacements were necessary in a group of 330 children. The indications for replacement in their study included enophthalmic prosthesis, rotation within the socket, loose fit, decentration of the cornea, cosmetically significant ptosis, prosthesis discoloration, lost prosthesis, replacement following implant exchange surgery and combinations of these factors. They concluded that replacement of an ocular prosthesis in children is more frequent than in adults and its useful life (months or years depending on the patient's ophthalmological status) must be customized for each patient.

It is necessary to be especially careful in children without orbital implants, as these are a major factor contributing to orbital growth [22]. In such cases, the presence of the prosthesis becomes the only element supporting growth and so it is important to ensure that successive replacements are made, as each becomes too small for the orbit [22,23]. Again in children, Ragge et al. [24] argued that if a microphthalmic eye has an axial length of less than 16 mm, such short axial-length eyes alone are unlikely to promote normal orbital growth. Therefore, it is necessary to increase the socket volume early on in life to prevent more pronounced asymmetry as the child grows. They proposed fitting a purpose-made cosmetic shell (a thin ocular prosthesis) over the eye, or remnant, to promote orbital growth. Clear shapes will need to be fitted initially in the case of eyes with some residual vision [24,25].

As a conclusion, replacement of the prosthesis in children depends on the ophthalmological status and age and must be customized for each patient. If the defect is present at birth, the assessment would best be carried out in the first two weeks of life [24]. The initial socket-expansion phase involves frequent visits to hospital for sequential fitting of progressively larger acrylic shapes. Other methods such as hydrophilic expanders may also be used, with or without moulding of the socket under anaesthesia [24,26]. After the initial socket expansion, practitioners should be aware of the above indications for replacement and establish a regime of at least yearly revision over the first 5 years of life.

4. Wearing the ocular prosthesis

The recommended use of an ocular prosthesis is 24 h a day [3]. It is generally not removed at night (except for patients with very specific problems) because this can cause the lids to fold and inflame the conjunctiva, or lachrymal fluid to accumulate at the bottom of the cavity, favoring infection [3]. If withdrawal is necessary for any reason, it can be kept in distilled water or sterile saline to avoid eye secretions drying on the surface [17]. Laiseca et al. [17] stated that the prosthesis should never be removed for