

## Two Approaches in the Cosmetic Rehabilitation of Patients with Post-Traumatic Subatrophy of the Eyeball

Tsurova LM<sup>1,2</sup>, Milyudin ES<sup>1,2</sup> and Kondrova KU<sup>2</sup>

<sup>1</sup>Samara State Medical University, Eye Research Institute, Chapaevskaya Str, 89, Samara, 443099, Russia

<sup>2</sup>Samara Regional Clinical Hospital named TI Eroshevsky, New Garden Str, 158, Samara, 443068, Russia

\*Corresponding author: Tsurova LM, Samara State Medical University, Eye Research Institute, Chapaevskaya Str, 89, Samara, 443099, Russia and Samara Regional Clinical Hospital named TI Eroshevsky, New Garden Str, 158, Samara, 443068, Russia, Tel: +8(927)-605-64-01, E-mail: leyla\_tsurova@mail.ru

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### Abstract

**Objective:** To define groups of patients who may hold prosthetics subatrophic eyes and removes the eye with subsequent prosthetics

**Patients and Methods:** Under observation from 2010-2017 was 152 patients with posttraumatic subatrophy (the average age is 46.1 years), divided into 2 groups: 1-102(67,1%) patient who underwent enucleation with the for-mation of the locomotor stump - 56 (55,0%), evisceration - 46 (45,0%); and group 2 - 50 (32.9%) and patients who have had prosthetic subatrophic eyes. Was performed in all patients: visual acuity testing, biomicroscopy, ultrasonic biometry, ultrasonic scan, tonometry, computed tomography of the skull and immunological blood test to determine sensitization to the tissues of the eye

**Results:** In group 1, indications for enucleation were: post-traumatic subatrophy stage 1, combined with a sluggish post-traumatic uveitis and the threat of sympathetic ophthalmia pair of the eye - 38 (37.2 per cent) and subatrophy of the eyeball 2 and stage 3 with the fast - and slow - progressing forms of the flow - 64 (85.3%). Of the total number of patients of the first group 99 (97%) patients made up adults, of which 58 (56.8%) males, 41 (40,2%) women and 3 (3.0% of) children. All patients underwent the formation of the locomotor stump. In group 2 patients with post-traumatic subatrophy of the eyeball conducted prosthetics: 22 (44%) patients from the 2 stage of subatrophy, 28 (56.0%) of patients with 3 stage of subatrophy. Of which 44 of them (84.3%) adult patients, 28 (66.7 percent) men, 16 (33.3 %) women and 6 (15.7 per cent) children. Persistent sensitization to the vascular antigen against the backdrop of steroid therapy is an absolute indication for removal of the eyeball in posttraumatic subatrophy. Contraindications for prosthetics subatrophic eyes are: the positive results of immunological studies of blood, clinical manifestations of indolent uveitis, high intraocular pressure and recurrent given.

**Conclusion:** 32.9% of the patients with post-traumatic subatrophy possible the cosmetic rehabilitation without removal of the eyeball in the late posttraumatic period (10-12 months after the injury) under the following conditions: the absence of sensitization to antigen in vascular tissues of the eyes and regular inspections. Enucleation was and remains the radical treatment of posttraumatic subatrophy. To obtain the best cosmetic outcomes of prosthetic eye removal should be carried out with the formation of the locomotor stump with implantation of the orbital ear

**Keywords:** Ophthalmo Prosthesis; Enucleation; Subatrophy; Anophthalmos

### Relevance

Serious injuries and extensive wounds of eye and their consequences results in subatrophy of the eyeball. This is the most actual problem in ophthalmology in present time. Frequency of childhood trauma has high rate in the structure of traumatic injuries of the eye [1]. Long-term experience of observation has showed that removing the eye in childhood without replacing the orbital cavity with eye prosthesis leads to slow growth of the orbit and corresponding part of the skull. It results in asymmetry of the face. About 10% of children after the injury become visually impaired. It happens as a result of the development of severe post-traumatic complications such as traumatic cataracts, vitreous fibrosis, retinal detachment, sympathetic ophthalmia, and in the absence of proper treatment, subatrophy passes into atrophy. It can subsequently lead to the removal of the eyeball [2]. In recent years, there is increasing rate in the specific gravity of the subatrophy of the eyeball due to trauma and vascular disease from 7-22% to 29.6-36.9% [3]. In 6.5% -26.5% of patients, subatrophy ends with functional and anatomical death of the eye, that followed by its removal, 78-92.6% of them are persons in age under 40, 34,3% are children [4-6]. It is very important to perform enucleation with the formation of a locomotor stump and implantation of porous orbital liners for cosmetic rehabilitation of patients with

subatrophy [7]. There are strict indications for removal of subatrophic eyes: severe eye injuries, for the prevention of sympathetic inflammation, in the presence of unaesthetic blind eye with signs of chronic uveitis, when prosthetics is impossible and the patient insists on removing the eye for cosmetics. But not all patients are immediately ready for cosmetic rehabilitation - removal of the eye with orbital implantation and prosthetics [8,9]. The objective of modern ophthalmology is ensuring the maximum possible cosmetic and medico-social rehabilitation of patients with eyeball subatrophy. Cosmetic side of the problem stands on the first place for patients with posttraumatic subatrophy of the eyeball. There are more than 320 thousand people needs in prosthetics in the Russian Federation [10]. In cases where it is not possible to store a subatrophic eyeball and there are antiperspirant indications for the selection of a cosmetic prosthesis, we perform an eyeball removal with orbital reconstruction and formation of a locomotor stump with orbital implants. The aim of research was to determine groups of patients, which can performing by prosthetics for subatrophic eyes and have indications for removal of the eye with subsequent prosthetics.

## Patients and Methods

There were 152 patients aged 7 to 68 years (mean age  $46.1 \pm 1.6$  years) in observation with complications of severe injuries for the organ of vision on the base of the traumatology department and the laboratory of the individual eye prosthetics of Eye Hospital named TI Eroshevsky, Women-57 (37.5%), Men-86 (56.5%), Children - 9 (6.0%). The observation period was 7 years (2010-2017). Patients were divided into two clinical groups: 1 group-102 (67.1%) patients-surgical intervention was performed - removal of the eyeball with the formation of the locomotor stump; Group 2-50 (32.9%) people with prosthetics of subatrophic eyes. All patients underwent ophthalmological examination: visometry, biomicroscopy, ultrasonic biometry, ultrasound B-scan, tonometry. To select the size of the orbital implant, radiography and computed skull tomography were performed before removal of the eyeball. Indications for enucleation in the first group of patients were: complications of severe eye injuries: stage 1 subatrophy (PZO was 18-20 mm) in combination with posttraumatic chronic uveitis with risk of sympathetic ophthalmia of the paired eye - 38 (37.2%). And the second main reason for eye removal was subatrophy of the eyeball 2 and 3 stages (PZO was 15-17 mm) with fast and slow-progressive forms of disease course - 64 (85.3%) (Table 1).

Pathology	Quantity
Subatrophy stage 1 with posttraumatic chronic uveitis	38 (37.2%)
Subatrophy stage 2 with fast and slow-progressive forms	64 (85.3%)

**Table 1:** Distribution of patients of the 1st group according to the pathology of the eye

From the total number of patients in the first group, 99 (97.0%) in adults, 58 (56.8%) men, 41 (40.2%) women, and 3 (40.2%) were childrens (Table 2).

Patients	Quantity
Men	58 (56.8%)
Women	41 (40.2%)
Children's	3 (40.2%)

**Table 2:** Distribution of patients of the 1st group

The visual acuity of the damaged eyes: totally blindness - 0 (zero) was noted in 87 (85.2%) cases, incorrect light projection in 15 (14.3%) cases. In 32 (31.3%) patients had positive results of immunological examination of blood - sensitization to the uveal tissue (soudistome antigen), which created the risk of sympathetic inflammation in the paired eye. We used following methods of removal the eyeball: enucleation - 56 (55.0%), evisceration - 46 (45.0%) with resection of the posterior pole of the sclera with nevrectomy (according to the Filatova IA method) with the formation of post-nucleation stump. Formation of the locomotor stump with orbital implants was performed for all patients of the 1st group, in 94 (92.2%) cases - an orbital bone implant with porous structure and a conical shape; in 8 (7.8%) - a synthetic implant of polymethyl methacrylate. This endoprosthesis has form of a sphere with a mesh coating. The choice size of the orbital implant depends on data of the complex examination: ultrasound biometry of eyeballs, radiological examination of the facial skull and computer tomography of orbits. In second group of patients with posttraumatic subatrophy of the eyeball we performed toned-bone prosthetics: 22 (44.0%) patients with stage 2 subatrophy (15-20 mm), 28 (56.0%) patients with stage 3 subatrophy (PZO was 10-12 mm) (Table 3).

Pathology	Quantity
Subatrophy stage 2 with posttraumatic chronic uveitis	22 (44.0%)
Subatrophy stage 3 with fast and slow-progressive forms	28 (56.0%)

**Table 3:** Distribution of patients of the second group according to the pathology of the eye

Of these, 44 (84.3%) of adult patients, including 28 (66.7%) men, 16 (33.3%) women, and 6 (15.7%) children (Table 4).

Patients	Quantity
Men	28 (66.7%)
Women	16 (33.3%)
Childrens	6 (15.7%)

**Table 4:** Distribution of patients of the second group

Visual acuity in all patients of the 1st group was absent - 0 (zero) in 100.0%. All patients (100.0%) had negative results of immunological examination of blood - signs of sensitization to the uveal tissue (vascular antigen) of the eye were not detected. In 34.4% of cases we performed primary standard prosthetics, in 65.6% - individual prosthetics for patients with posttraumatic subatrophy of the eyeball.

## Results and Discussion

Trigger mechanism in the pathogenesis of posttraumatic subatrophy is damage of the uveal membrane, which leads to rupture of vessels, increased fluid exudation and edema of surrounding tissues, and it results to paresis and dilatation of the vessels. Secretory capacity of the ciliary body decreases, detachment develops, which leads to hypotension, trophic disorders in the eye tissues, fibrosis of the vitreous body, the eyeball decreases in size and deforms. As is known, one of the main mechanisms of posttraumatic subatrophy is the chronic immune inflammatory process in the injured eye. That's why all patients with the complications of severe eye injury are obliged to have an immunological study of blood - the inhibition of migration of leukocytes to the vascular antigen to determine the sensitization damaged tissues of the eye. In case of positive or questionable results, we resolve problem with removal of the subatrophic eye for presence a threat of sympathetic ophthalmia in the twin eye. Active sensitization to the vascular antigen against steroid therapy is an absolute indication for removal of the eyeball in posttraumatic subatrophy. Relative indication for removal of the subatrophic eyeball is the lack of opportunity for patient to be treated and observed by ophthalmologist. Progressive subatrophy, manifested by active reduction of the eye PZO and the development of severe hypotension is an indication for removal of the eyeball even in the absence of sensitization to the vascular antigen. We have done surgeries in all the patients of the 1st group with the formation of the locomotor stump. Avoiding the risk of postoperative complications (exposure or rejection of the implant), we followed to method of stepped prosthetics (according to Filatova IA): a medical prosthesis was intraoperatively installed, when the edema of orbital tissues decreased on 7-10 day after surgery, we selected standard prosthesis. Individual prosthetics were performed through 4-6 months after surgery, when the formation of conjunctival arches and orbital cavity was completed. Patients were under dynamic observation in period of time: 1 month, 6 months, 12 months after the removal of the eyeball. Patients were observed once in 24 months after the individual prosthesis was established.

Glasprosthetics is possible with a favorable course of the process in the subatrophic eye, when it confirmed by clinico-immunological studies and absence of visual functions. Thin-walled prosthetics of subatrophic eyes in patients of group 1 was performed with the following indications: the period after injury was not less than 12 months, negative results in immunological examination of blood for determine sensitization to damaged eyes, absence of visual functions and signs of posttraumatic uveitis, no pain, low sensitivity of the cornea, moderate or severe hypotension. This category consisted patients with 2 and 3 stages of subatrophy (PZO made from 10 to 17 mm) with a stationary form of subatrophy and post-traumatic process in the eye. Contraindications for prosthetics of subatrophic eyes: positive results of immunological examination of blood, clinical manifestations of chronic uveitis, high intraocular pressure and recurrent hyphema. In these cases we have done removal of subatrophic eye due to presence threat of sympathetic ophthalmia in twin eye. Before the initial prosthetics and during further individual prosthetics (once every 6-8 months), we have done an immunological study of the blood - the inhibition migration of leukocytes to vascular antigen for determine the sensitization in damaged tissues of the eye. We prescribed non-steroidal anti-inflammatory drops during the month in the initial prosthetics for patients with eye subatrophy with preventive purposes. An important condition for subatrophic eyes prosthetics is initial selection of thin-walled prosthesis, it performed through one year after trauma or surgical intervention. All patients were under dynamic observation - one month after initial prosthesis and once every 6 months, and systematic immune researches (once every 6-8 months). We instructed all patients on further tactics in case of subjective impairment in subatrophic eye. Unfortunately, some patients who are using eye prostheses, have deficiency of tear production. It leads to insufficient moistening of mucus-eyelid and surface of eye prosthesis, and this creates unpleasant discomfort. In these complaints, we prescribe lubricants, in particular, lubricant drops of the COMOD® system (chylo comod or chylosar). It have a viscosity and high adhesive properties, contain hyaluronic acid, that binding and retaining aqueous layer tear on the surface of prosthesis in sufficient quantity, which facilitates the blinking process and prevents "sticking" of prosthesis under eyelids. The adaptation of a person without eye (as a functional or anatomical organ) to the environment is greatly complicated, the choice of profession is limited, professional skills are often lost. The sudden loss of binocular vision, a violation in evaluation of distance and depth of space cause difficulties. Completing performance of simple functions everyday and working, all are ultimately reflected in the psychological status of patients [11]. Results of eye prosthetics in patients with subatrophy and after removal of the eyeball, we evaluated according to the following objective parameters: the symmetry of eye slits, closing of eyelids, position of prosthesis in cavity, mobility of the eye prosthesis, degree of subjective evaluation in cosmetic results of prosthetics.

In all cases (100%) we observed complete symmetry of the eye slits, complete closure of eyelids in 93.7% of patients, 6.2% had an incomplete closure of eyelids by 3 mm with posttraumatic cicatricial changes in the eyelids; in 100% of cases position of prosthesis in the cavity were stable; mobility of the eye prosthesis had from 65 to 75% of mobility in twin eye. All patients have noted absence of discomfort when they are wearing eye prosthesis and they were very pleased by cosmetic result of prosthetics in all cases (100%). There were not signs of exacerbation uveitis and development of sympathetic ophthalmia in twin eye during the time of observation in patients with subatrophy from 1 to 7 years old.

## Conclusion

In this way, 32.9% patients with posttraumatic subatrophy can have cosmetic rehabilitation without removing the eyeball in late posttraumatic period (10-12 months after injury), with the following requirements: no sensitization to the vascular antigen in eye tissues and regular examinations. Enucleation was in past and in present the radical method of treatment post-traumatic subatrophy. To obtain the best cosmetic results of prosthetics, the removal of the eye should be performed with formation of a locomotor stump and implantation of orbital liners.

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