

The contribution of Acad. N.A. Puchkovskaia to advances in ocular trauma management

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The paper has sought to summarize the contribution of Acad. N.A. Puchkovskaia to advances in the understanding, treatment and care of people with eye trauma. The unified emergency eye trauma care system was established in Ukraine through her initiative to provide high-quality emergency care in severe ocular trauma not at the injured person's place of residence but at a specialized care center to which s/he is transported in emergency. The techniques that N.A. Puchkovskaia developed to manage traumatic eye injuries (like superficial therapeutic lamellar keratoplasty technique for surgical processing of corneal lacerations, "keratoplasty with two grafts" for the treatment of traumatic corneal defects, advanced techniques for IOFB removal from hard-to-access eye areas, and tissue homografts for extensive traumatic corneal and scleral injuries) are still successfully used today. The ultrasonic and laser technologies that she proposed to use in ocular trauma management were further developed. The Ocular Trauma Department that was established at the Filatov Institute through the initiative of N.A. Puchkovskaia 55 years ago, maintains the basic principles of management for eye injuries, and is a Ukrainian leader in providing specific medical care to the critically injured eye trauma patient.

The sudden nature of injury and the risk of sight loss make eye trauma one of the most feared and potentially handicapping medical problems. The issue is still important, as the prevalence has been high for decades and traumatic ocular injuries account for a significant percentage of all eye patients over the world, including Ukraine. The incidence of traumatic ocular injuries leading to visual impairment or blindness is expected to rise globally and even in the developed countries. In a speech at the 3rd Ukrainian Ophthalmology Congress in 1956, Acad. Filatov named the advances in eye trauma management his second most important achievement. In addition, he believed that this area would remain one of the institute's major research involvements for years.

In subsequent years, the advances in the field of eye trauma were associated with the name of Acad. N.A. Puchkovskaia. She initiated the establishment of a new department, the Ocular Trauma Clinic, at the Filatov institute, in 1963. Initially, the department was headed by Professor Z. M. Skripnichenko, who was succeeded by

I.M. Logai, Dr Sc (Med) and thereafter by G.E. Venger, Dr Sc (Med). Since 1992, it has been headed by T.A. Krasnovid, Dr Sc (Med).

Acad. Puchkovskaia gained experience in managing patients with eye trauma during the Great Patriotic War, and assigned high priority to the need for timely and adequate care for these patients to facilitate best possible outcomes [1, 2]. Such an approach to emergency care for traumatic ocular injuries required more effective organization of treatment for eye trauma [3].

N.A. Puchkovskaia initiated issuing an order by the Ministry for Health of Ukraine in 1976. Under this order, in Ukraine, round-the-clock emergency care for traumatic ocular injuries was to be provided at the Republican Ocular Trauma Center (ROTC) and oblast Ocular Trauma Centers (OOTCs) which were established at the facilities of the Filatov Institute Ocular Trauma Department and eye departments of regional hospitals, respectively. In this

way, the first unified emergency eye trauma care system in the USSR was established in Ukraine. Therefore, in severe ocular trauma, high-quality emergency care was to be provided not at the injured person's place of residence but at a specialized care center to which s/he was to be transported in emergency.

The relevant Guidelines [4] contained regulations of these centers, indications for referral, and specifications for the amount of required care. Subsequently, centers similar to those in Ukraine were established in Russia and other republics of the former USSR.

Timeliness and quality of emergency care and increased use of advanced pharmacotherapeutic approaches contributed to substantial improvement in treatment outcomes of patients with eye trauma. A peer review of the performance of the new form of treatment organization for traumatic ocular injuries found evidence of increased efficacy of emergency care, with improved visual outcomes and enucleation percentages in patients with ocular trauma.

N.A. Puchkovskaia and co-authors developed an ocular trauma classification system [5] and contributed much to the development of new approaches to corneal transplant for patients with traumatic ocular injuries.

In addition, she and her disciples took on the mantle of performing keratoplasty for traumatic leukoma from Acad. Filatov who was performing it as early as 1942 [6, 7].

Novel keratoplasty techniques for penetrating globe injuries were developed under the guidance and with direct participation of N.A. Puchkovskaia. In 1971, she developed and utilized the superficial therapeutic lamellar keratoplasty technique that became widely adopted for surgical processing of corneal lacerations. The "keratoplasty with two grafts" [8] became widely adopted by clinicians for the treatment of traumatic corneal defects. The use of the methods developed under the guidance, and with direct participation of N.A. Puchkovskaia for optical keratoprosthesis enabled restoration of sight to patients with previously incurable severe post-traumatic corneal opacities [9]. She initiated the research by Eye Trauma and Roentgen Departments of the institute in order to (a) systematize and enhance the methods for roentgen diagnosis of an intraocular foreign body (IOFB) and ultrasonography for localization of roentgen-negative IOFB, (b) develop methodologies for localization of IOFBs, (c) and develop a differential approach to the removal of IOFBs varying in localization. New magnets for eye microsurgery and advanced techniques for IOFB removal from hard-to-access eye areas were developed.

N.A. Puchkovskaia, V.F. Voïno-Iasenetskiï, and V.V. Vit conducted studies on ocular-trauma related wound process, tissue regeneration, changes and growth, and findings of these studies were used in experimental and clinical research on tissue homografts for extensive traumatic corneal and scleral injuries. This research was also guided by N.A. Puchkovskaia [10].

Filatov Institute research on iridoplasty for various traumatic iris injuries is associated with the name of N.A. Puchkovskaia [11].

As early as 1963, the Institute guided by N.A. Puchkovskaia became the first site in the former USSR where a laser oscillator was used for treating eyes and a laser device was developed for ophthalmological applications in collaboration with physicists from Moscow [12].

Acad. Puchkovskaia and co-authors were the first in Ukraine to perform laser photocoagulation for post-traumatic and postoperative iris cysts [13]. Under her guidance, ultrasound applications for diagnosis and treatment of eye disease were introduced in the institute, and novel apparatuses and devices were developed. She paid special attention to improvement of medical and social rehabilitation of patients with a history of ocular trauma and to prevention of handicapping associated with injury to the eye.

The Ocular Trauma Department of the Institute became the first site in the former USSR where an experimental and technical research was conducted, under the guidance, and with participation of N.A. Puchkovskaia, to develop an ultrasonic phacoemulsifier and to study the properties of ultrasonic vibrators varying in design [14].

Broad clinical expertise of department staff in performing ultrasound phacoemulsification for senile, congenital or traumatic cataracts was used to determine indications for phacoemulsification with the support and direct participation of N.A. Puchkovskaia, and the Institute became one of the first medical establishments in the USSR to introduce ultrasound phacoemulsification in the clinical practice [15].

N.A. Puchkovskaia paid much attention to intraocular correction of refractive errors. She developed, in collaboration with E.A. Golubenko (1985), the IOL with mixed fixation which has been widely introduced in the clinical settings.

Boris Paton, the President of the National Academy of Science, who knew N.A. Puchkovskaia well, offered some warm words of wisdom about her on the occasion of her 100th anniversary: "Nadezhda Aleksandrovna was an outstanding disciple of V.P. Filatov, an unforgettable person, and this gave her an opportunity to gain a lot of knowledge, a lot of experience, and, subsequently, to become the Director of this great institute ... to become not just a director, but a person generating ideas, creating science schools, and helping young people, and thus the institute improved its areas of research and academic activities, and, at the same time, remained worthy of the name of V.P. Filatov. Nadezhda Aleksandrovna explored also laser technology while working at the eye clinic, and thus contributed to the advance in the field..... these were the first steps toward the application of lasers in ophthalmology. Today, this technology is being actively further developed and applied."

On the occasion of the 110th anniversary of Acad. N.A. Puchkovskaia, it should be mentioned that, nowadays, the Department for Post-traumatic Eye Pathology that was established through her initiative is a Ukrainian leader in providing timely and specific medical care to patients with severe ocular trauma.

The Republican Ocular Trauma Center (currently, the Ukrainian Ocular Trauma Center) (1) operates at the premises of the Department for Post-Traumatic Eye Pathology, (2) has all necessary up-to-date equipment, (3) is staffed with trained eye trauma surgeons, anesthesiologists, roentgenologists, nurses and paramedical workers, (4) provides round-the-clock professional emergency care for a fresh severe trauma, and provides all types of medical rehabilitation for sequelae of traumatic eye injury. Annually, over 4000 patients with severe trauma and sequelae from Ukraine and abroad are consulted by experts, and about 1000 patients receive in-patient treatment at the Eye Trauma Center. Over the last four years, the center has been providing professional consultations and treatment to casualties of combat in eastern Ukraine.

Specialists of the center regularly perform analysis of (a) the types, causes and nature of trauma in patients, and (b) the amount of care provided to patients with eye trauma. In addition, they visit all the regions of Ukraine to share their methodological experience in the field with local colleagues, and to provide treatment to local patients. Furthermore, they regularly publish guidelines and newsletters to inform Ukrainian ophthalmologists on the novel approaches to the diagnosis and management of patients with traumatic eye injuries.

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