

# Neurosurgery in Russia and USSR

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Received: March 2, 2015; Accepted: March 12, 2015

Keywords: Neurosciences in Iran; Neurosurgery in Iran

## 1. Neurosurgery in the Russian Empire

In pre-revolutionary Russia the first routine brain tumor surgeries were performed by A.L.Falkenberg and V.L.Dunin in 1891. In 1892 in Kiev K.M.Sapezhko removed extracerebral tumors of cerebrum hemispheres in 2 patients with good outcomes. In 1896 in St-Petersburg G.F.Tseidler removed glioma of the cerebellum diagnosed by V.M.Kernig. This case was widely recognized. Surgical instruments were developed: encephalometer by D.N.Zernov (1889) tomotrepinechisel by A.S.Tauber (1898), chisel – by V.I.Razumovsky etc. First monographs on cerebral surgery appeared in 1898: “Surgery of the brain. Clinical lectures” by A.S.Tauber and “Topography and operative surgery of the skull cavity” by N.K.Lysenkov. In the 90-ies of the 20th century in Kazan regular operations on the brain started to be performed in a neurological clinical hospital headed by Prof. L.O.Darshkevich.

The basis for a specific development of surgical treatment of the nervous system pathology in Russia was made by its active supporter a neurologist V.M.Behterev. An operating room in a neurological department (may have been the first in the world) was opened by the initiative of Behterev in 1897 in St-Petersburg.

A disciple of Behterev – L.M.Pussep – became the first “surgeon-neuropathologist” who systematically operated on the central and peripheral nervous system.

In the early 20th century the first department of surgical neuropathology in the world was opened, which was in 1915 the basis for setting up the Petrograd military clinical hospital named after N.I.Pirogov for head-injured soldiers and the first faculty on this discipline (1908)

In 1926 in Leningrad a disciple of V.M.Behterev A.G.Molotkov established the institute of surgical neuropathology consisting of 3 departments; 1) clinical for 70 beds, 2) experimental, including a biochemical laboratory, clinical treatment and vivarium, and 3) pathoanatomical, with a special laboratory for studying anatomy and histology of the nervous system.

The main spheres of interest of the institute were: surgery of peripheral nerves, vegetative nervous system and pains.

In 1938 the Leningrad scientific research neurosurgical institute named after A.L.Polenov was established based on the institute of surgical neuropathology and neurosurgical clinical department of the traumatology institute. The number of hospital beds was enlarged to 140 and distributed into 5 departments: trauma of the CNS (central Nervous System), surgery of the peripheral nervous system, surgery of the vegetative nervous system, and male and female neurooncology. The efforts of the Leningrad institute were also concentrated on arranging a neurosurgical service in the country.

In February 1929 N.N.Burdenko and V.V.Kramer set up a neurosurgical clinical department for 25 hospital beds at the State Roentgenology institute, which in January 1932 was transformed into Moscow neurosurgical scientific research institute. By 1936 the number of hospital beds had grown to 100 and then to 150. The institute had 4 sectors (surgical, morphological, neurological and physiological), and 8 departments and laboratories (physiological, clinical and experimental laboratories, biochemical, otoneurological and ophthalmological department etc).

In the 1930-es a great school of native neurosurgeons was formed at the Central neurosurgical institute including: Burdenko N.N., Egorov B.G., Arendt A.A., Koreisha L.A., Terian K.G., Kadin L.S., Bryusova S.S., Shlykov A.A., Arutunov A.I. and many others. Based on the principles formulated by N.N.Burdenko, all of them regarded neurosurgery as a complex discipline and an operative intervention – as an emergency experiment and necessity for operating on the brain and spinal cord based on the anatomy, physiology and technical equipment and tools.

Simultaneously at this period of time a school of neurologists was formed at the Institute: Kramer V.V., Rapoport M.Yu., Konovalov Yu.V., Podgornaya A.Ya., Korst L.O.

and others. Their special task was to develop in detail the topical diagnosis of local lesions of the nervous system comparing semiotics and clinical course of the disease with surgical outcomes and autopsy data.

In the pre-war time the Central neurosurgical institute became "alma mater" of the national schools of:

neuroradiologists: Kopylov M.B., Altgauzen N.N., Koon A.M.

neuromorphologists: Chernyshev A.S., Klovovsky B.N., Mogilnitsky B.N., Blinkov S.M., Smirnov L.I.

neurophysiologists: Anokhin P.K., Negovsky V.A., Rusinov V.S.

otoneurologists: Tsymmerman G.S., Ageeva-Maykova O.S.

neuroophthalmologists: Blagoveschensky M.N., Skorodumova A.V.

Alongside with neurosurgical schools existing in St-Petersburg and Moscow, a remarkable role in development of neurosurgery as a clinical discipline in the USSR in the war-free time belonged to regional schools presented by V.N.Shamov, Z.I.Geimanovich., Ya.M.Pavlonsky in Kharkov; by M.B.Yukelson, P.S.Balitsky in Kiev and by P.I.Emdin, H.I.Garkavi, D.G.Shefer in Rostov.

In 1934 a scientific neurosurgical council was formed at the Central neurosurgical institute which in 1939 was reorganized into the Neurosurgical society (however, de facto the activity of the All-Union Society of neurosurgeons was started only in 1948). A professional periodical "Voprosy Neurochirurgii" was founded in 1937 in the USSR; it was the second neurosurgical periodical in the world after "Zentralblatt für Neurochirurgie" which has been issued in Germany since 1936.

In the second part of 1930s neurosurgery chairs were founded at the State institute of postgraduate education in Leningrad (Head of Chair - A.L.Polenov) and Central institute of postgraduate education in Moscow (Head of Chair - N.N.Burdenko), the main objective of which was neurosurgical training.

## 2. Soviet Neurosurgery During the Second World War

Expecting the war, N.N.Burdenko's special task was to train neurosurgeons of the country for it. In fact, he laid the basis for military field neurosurgery. A complex system for evacuation was formed and step-by-step neurosurgical treatment of patients with gunshot head and spine injuries, as well as injuries of the peripheral nerves including medical enhancement company for the front, front-line hospitals and evacuation hospital "HEAD" in the rear.

In August 1941 Prof. N.N.Burdenko was appointed Chief surgeon of the Red Army. The Neurosurgical service of the Leningrad front was headed by Prof. I.S.Babchin.

Among the leading neurosurgeons of the county who went to the front line were: A.I.Arutunov, V.N.Shamov, B.A.Samotokin, L.A.Koreisha., I.M.Irger, V.A.Goihman,

M.A.Salazkin and many others. Prof. A.L.Polenov stayed in the besieged Leningrad, Prof. B.N.Klovovsky - in Moscow. Other brilliant neurosurgeons like B.G.Egorov and A.A.Arendt went to the rear to direct evacuation of "HEAD" hospitals.

Alongside with intensive practice, neurosurgeons performed scientific investigations developing new methods of treatment of gunshot and missile injuries of the central and peripheral nervous system.

In July 1943 the Moscow institute of neurosurgery was visited by prof. Y.Penfield arriving in the USSR as a member of the British-American-Canadian mission. He got interested in the arranged neurosurgical service in the Red Army finding out that 3300 of 7000 neurosurgical beds were at the front line.

The main result of the Soviet military field neurosurgery was the return of over 70% of soldiers with head, spine and peripheral injuries to combat actions.

## 3. Soviet neurosurgery in the post-war time

After the Second World War the neurosurgical service of the Soviet Union developed rapidly, first of all thanks to the organizational activity of Moscow (B.G.Egorov, A.I.Arutunov) and Leningrad (V.N.Shamov, V.M.Ugrumov) institutes of neurosurgery. Neurosurgical departments in multi-profile clinical hospitals were opened in all republican, areal, regional centres, and large cities. In 1950 the Ukrainian Institute of neurosurgery was opened in Kiev. In the 60-ies large regional neurosurgical centres were set up in the North-West, in Nizhny Novgorod, Kazan, Samara, Saratov, Rostov, in the Urals, Novosibirsk, Krasnoyarsk, and Khabarovsk etc., thus enveloping a vast territory of the country by specialized urgent and ordinary neurosurgical care for the population.

Starting from 1976 neurosurgery became an independent discipline; there were organized neurosurgical chairs and training courses. Postgraduate neurosurgical education was gradually developed, as well as international cooperation between neurosurgeons. And as an example of this, professors A.I.Arutunov, E.I.Kandel, A.N.Konovalov were elected Vice-presidents of the WFNS.

## 4. Modern Neurosurgery in Russia

After the disintegration of the USSR in 1991, neurosurgical services developed independently in each of the republics.

The Russian neurosurgery of today has considerably improved. Methods of non-invasive neuroimaging have been introduced into everyday practice (CT, MRI, ultrasound diagnosis). Microneurosurgery, endoscopic techniques, endovascular interventions, intraoperative navigation and neurophysiological monitoring have been widely used. Pediatric, vascular, spinal, functional and reconstructive neurosurgery is actively developing.

Nowadays, alongside the Institute of neurosurgery in Moscow and St-Petersburg, Federal centres of neurosur-

gery are functioning in Novosibirsk and Tumen. Regional neurosurgical centres in the Volga region, Kuban, in the Urals, Siberia and Far East have lately made progress.

The modernization process has recently taken place in the N.N.Burdenko neurosurgical institute (300 neurosurgical beds), namely: new neurosurgical buildings with up-to-date diagnostic and surgical equipment and modern facilities have been built; a new radiosurgery and radiology centre has been opened. Here annually about 9000 complicated operations on the brain and spinal cord are being performed, with mortality not exceeding 1%.

In 2014 in Russia, the largest country of the world by territory (17 million 125,187 square kilometers), 300 neurosurgical departments function for 146,1 million people with 2900 actively working neurosurgeons. Alongside urgent neurosurgical care rendered for patients with head injuries, cerebral vascular pathology is also being widely treated in Russia. It became possible mostly due to recently opened specialized vascular centres, which use modern methods of diagnosis and treatment of ischemic and hemorrhagic strokes, subarachnoid parenchymatous hemorrhages caused by arterial aneurysms and AVMs and others.

A considerable decrease of overall mortality from neurosurgical pathology has resulted in increased disability

rates. For these reasons, there is a strong need for developing neurorehabilitation, what is considered one of the most important aspects of recovery after neurosurgical operations.

Neurosurgical life in Russia is being activated. In 1995 an Association of neurosurgeons of Russia was founded with its congresses arranged every 3 years. The number of professional periodicals has grown from 1 to 5.

The research work at the institute has been activated, and international professional contacts between Western and Eastern countries have been expanded. Since 2008 representative Moscow international neurosurgical forums have been regularly arranged at the institute. The achievements of Russian neurosurgery are widely recognized worldwide, and Alexander Kononov was elected Honorary President of the WFNS, and Alexander Potapov – Vice-President of the WFNS. It is worth mentioning the worldwide recognized priorities of the Russian neurosurgery and adjacent disciplines like neuropsychiatry (A.R.Luria), quantitative neuroanatomy and neurology (S.M.Blinkov), functional neurohistology and stereomorphology (M.A.Baron), resuscitation (V.A.Negovsky), endovascular neurosurgery (F.A.Serbinenko).

Today the Russian neurosurgery possesses a wide spectrum of modern technologies and techniques for operating on the central and peripheral nervous system.