

Emergence and Early Development of Russian Neurosurgery (1890s–1930s)

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This paper is a case study of specialization in clinical medicine — it is a story of the difficult and complicated birth of a neurosurgery clinic in Russia and the Soviet Union. It demonstrates the futile attempt to institute a new specialty as surgical neurology advocated by neuro(patho)logist V.M. Bekhterev (1857–1927) and implemented by his pupils L.M. Pussep (1875–1942) and A.G. Molotkov (1874–1950). However, surgical neurology was gradually replaced by neurological surgery performed by general surgeons N.N. Burdenko (1875–1946), A.L. Polenov (1871–1947), and V.N. Shamov (1882–1962).

Part of my paper is dedicated to the institutional history (emergence of the Institute of Surgical Neurology in Leningrad (in 1926) and the Central Institute of Neurosurgery in Moscow (in 1934). The Moscow Neurosurgical School was focused on lesions of the central nervous system whereas the Leningrad neurosurgical school dealt primarily with peripheral nerve surgery. In the 1930s neurosurgical clinics were established beyond the two capitals — in Rostov-on-Don, Kharkov, and Gorky.

*Similar to the centralized five-year planning in the Soviet economy, a new discipline of neurosurgery was also centralized and planned from Moscow in the 1930s. It was characterized by *kompleksnost'* — concentration of several auxiliary disciplines (neuroradiology, neuroophthalmology, neurophysiology, etc.) within neurosurgical research institutions in Leningrad and Moscow. Particular stress was made on the experimental nature of a new discipline, which was viewed as a sort of applied neurophysiology.*

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Introduction

When did neurosurgery become an independent clinical discipline? We cannot provide a definite answer to this question. The period of the first brain surgery procedures and the emergence of surgeons who specialized in such interventions cannot be considered to be the period of the establishment of a new discipline. This is a part of a wider problem of specialization in medicine. The interplay of global trends and local traditions might be seen in case of emergence and early development of neurosurgery in Russian Empire and USSR.

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Grounds for emergence of neurosurgery in Imperial Russia

The first cases of brain tumor removal in the Russian Empire were reported in the 1890s (Rapoport, 1948; Babchin, 1954). In parallel, new instruments for brain surgery were being developed, including Zernov's encephalometer (1889) and Tauber's tomotrepine (1898). First experiences of and literature on brain surgery were summarized in two monographs — "Khirurgiya golovnogo mozga. Klinicheskie leksii" ("Surgery of Brain. Clinical lectures") by A.S. Tauber (1898) and "Topografija i Operativnaja Khirurgija Cherepnoi Polosti" ("Topography and Operative Surgery of Cranial Cavity") by N.K. Lysenkov (1898).

At the turn of the twentieth century neurosurgical operations were occasionally performed by general surgeons. The removal of an x-ray-diagnosed bullet in the occipital region by Prof. L.L. Levshin (1902) and the removal of a spinal cord tumor by the surgeon I.D. Sarychev (1904) (diagnosed by I.M. Kron, a neurologist) could be mentioned (Bryusova, 1947).¹

By that time some contemporary surgeons wrote about the rapid development of "cranio-cerebral surgery" (cherepno-mozgovoi khirurgii) as could be demonstrated by the following preface by V.I. Razumovsky to the relevant section of a Russian surgical manual dated 1913:

Section X of "Russian Surgery" by the late prof. L.L. Levshin was published relatively long ago — in 1903–1905. Since then thanks to the joint harmonious work of surgeons, neurologists, ophthalmologists, and ENT-surgeons, cranio-cerebral surgery has made formidable advances. It can even be said that during a short period between 1905 and 1913 both scientific and technical progress in this branch of surgery is greater than in any other branches. (Razumovsky, 1913)

Neuro(patho)logist Vladimir Mikhailovich Bekhterev (1857–1927), who was a chair of nervous and mental diseases at the Imperial Military Medical Academy at St. Petersburg became one of the advocates of an emerging specialty. In 1897 a new building of a neurological clinic for 20 beds was opened at the academy. It included an operating room. He expected the evolution of neurology into a surgical specialty, as appears from his speech at the opening of the clinic:

As for establishing an operating room, this is a direct result of the recent development of the so-called brain surgery. It goes without saying nowadays, that several cranial diseases, some spinal cord and peripheral nerve ailments need surgical intervention. It is mostly neurologists who diagnose cases, which require surgical intervention and even define the way to perform it; surgeons just do the operation. Evidently, such a situation cannot be considered normal, because one should not stop halfway. Either surgeons should learn nervous diseases and bear all responsibility both for correct diagnosis and for the outcome of surgery, or neurologists should thoroughly study surgical maneuvers within their specialty and put them into practice. The way out of this situation is evident if one takes into consideration the development of separate medical specialties. In this respect neurology undergoes a transitional period like formerly in cases of obstetrics and gynecology, ophthalmology and quite recently — otorhinolaryngology. As you know, these specialties have gradually become surgical and their representatives are surgeons within

¹Five cases of spinal tumors were reported in Russian literature for the 20-year period from 1904 until 1924 (Opokin, 1939).

their specialty. The same should happen to neurology in the near future. If nowadays neurologists are still seeking surgical assistance, the future generation would probably need not do so. They will take the knife and do what should be done by themselves. (Bekhterev, 1897, p. 807; English translation by B. Lichterman)

Initially surgical interventions were occasionally performed by invited general surgeons with the idea to teach surgical techniques to young neurologists. Bekhterev's pupil Ludwig Martynovich Pussep (1875–1942; Figure 1)² called himself a “khirurg-nevropatolog” (surgical neurologist).³

A similar operating room was established in 1890s at the neurological clinic in Kazan, headed by Livery Osipovich Darkshevich (1858–1925)⁴ who invited surgeons and encouraged neurologists to assist them during operations on neurological patients.



Figure 1. L.M. Pussep (third from left) at an operating theatre (photo c.1915).

²The Russian transcription of the name is used. Born in Kiev in a family of a cobbler, Pussep graduated from the Imperial Military Medical Academy in 1899. In 1902 he defended his doctorate thesis “On Brain Centers of Penis Erection and Ejaculation” performed on dogs at Bekhterev's lab. The following conclusions in this thesis are of interest: “9) Nowadays neurologists with special surgical training are needed; 10) All mental hospitals have to have special surgical departments headed by a special surgeon” (Pussep, 1902, p. 177). Pussep participated in the Russian-Japanese war of 1904–1905. Since 1907 he was privat-docent at the Imperial Military Medical Academy, and since 1910 professor at the Psychoneurology Institute. In December 1920, Pussep emigrated to Estonia (a newly independent Baltic state after the collapse of Russian Empire) and changed his name for Puusepp. He was a chair of neurology and neurosurgery at Tartu University until his death.

³According to *The Oxford English Dictionary*, the term “neurosurgery” appeared for the first time in English language 1904 in the following heading of “Alienist and Neurologist”: “*Neurosurgery: Trigeminal Neuralgia Treated by Intraneural Injections of Osmic Acid*”. The notion of neurosurgery as cutting and injecting nerves was quite different from what is meant by neurosurgery nowadays. The term “neurosurgery” is absent in *A New English Dictionary* published in 1908. But does the lack of a term mean the absence of a subject? In France the emerging field was named as “neurologie chirurgicale” (surgical neurology). Similarly, the emerging field in Russia was named “khirurgicheskaya nevropatologija” (surgical neurology) by Bekhterev.

⁴Livery Osipovich Darkshevich (1858–1925) described the upper oculomotor nucleus that was later named after him (Darkshevich's nucleus) and wrote many works on neuroanatomy and neurophysiology. In 1892 he was appointed professor of neurological clinic at Kazan University, where he established an operating room, laboratory, and museum. He published a *Textbook on Nervous Diseases* in 3 volumes (1904–1917) — the first Russian neurological manual.

In 1907 Bekhterev founded the *Psikhonevrologichesky Institut* (Psychoneurology Institute) — the first private university in Russia. “Surgery of nervous system” is mentioned in the tentative program of the medical faculty as early as 1907, but in reality the medical faculty opened only in 1911 (Akimenko& Shereshevsky, 1999). In September 1910 a 32-bed neurosurgery clinic was opened at the Psychoneurology Institute and, in 1912, thirty-two cases were operated on at this clinic that employed professor Pussep (head of the clinic), two assistants, an ordinator (junior doctor), and two *feldsheritsy* (female physician assistants). The concentration of neurosurgical cases in a special department enabled Pussep to acquire the necessary experience. He could present the results of the surgical treatment of 24 brain tumors at the XIIth Congress of Russian Surgeons (Pussep, 1913). The tumor was totally removed in 11 cases with good outcomes in 6 cases. From six totally removed tumors of the posterior fossa, four cases died (mortality rate 67%). Later on Pussep reported 26 cases of cerebello-pontine angle tumors (mostly acoustic neurinomas) from 1910 to 1916 (Pussep, 1921). Five cases died before surgery. Out of 21 operated cases, 13 died within days or months after surgery (mortality 62%). Better results were seen in cases where the tumor was removed in two stages. Pussep considered 50% postoperative mortality rate in acoustic neurinomas acceptable (Pussep, 1921).

In 1912 the construction of a private clinic for a hundred beds for surgical neurology began. An anonymous person donated 200,000 rubles for this purpose. Due to the beginning WWI, this clinic was transformed into the Pirogov Petrograd First Military Hospital (1915) for head-injured warriors.⁵ In his opening address Pussep declared:

Nowadays Bekhterev’s words came true. Not only a neurologist performs surgical interventions but a special chair of surgical neurology has been established and a neurosurgery clinic named after our great teacher of surgery N.I. Pirogov has been opened. In this respect Russia is ahead of other countries since nowhere else neurology started to perform operations within its domain. (Pussep, 1915, p. 4–5)

Pussep started to publish the first neurosurgical manual *Osnovy khirurgicheskoi Nevropatologii* (*Foundations of Surgical Neurology*). Due to the October Revolution and subsequent Civil War the manual was not completed: only the first volume dedicated to the surgery of peripheral nervous system appeared in Petrograd in 1917 (Pussep, 1917).⁶ In 1918 the Pirogov hospital was transformed into Neurosurgery Institute directed by Pussep. In 1922 it merged with Patologo-refleksologicheskyy institut (Pathologo-reflexological Institute) headed by Bekhterev.⁷

⁵St. Petersburg was renamed to Petrograd in 1914 when WWI started. Petrograd was renamed to Leningrad after Lenin’s death in 1924.

⁶Three volumes of Pussep’s manual were published in Tartu in German language (Pussep L. *Chirurgische Neuropathologie*. I. Band. Die peripherischen Nerven. Tartu, Kommissionsverlag J.G. Krüger Ant.- Ges., 1932. –662S.; II. Band. Das Rückenmark. - 1933.-679S.; III. Band. Das Gehir. Erster Teil.-1939-552S.). Second part of the third volume and fourth volume dedicated to surgery of vegetative nervous system were not published due to the beginning of WW2.

⁷In fact by that time the Neurosurgery Institute ceased to exist. Just a few neurosurgery wards survived. In 1932 when the Pathologo-Reflexology Institute was renamed the Bekhterev Neuropsychiatry Institute a small neurosurgery department for 15 beds (out of total number of 380) was established. A.G. Molotov (see below) worked there (presumably on a part-time basis). See: *Pasport Nervno-psikhiatricheskogo Instituta im. V.M. Bekhtereva* (1936). GARF, Fond A-482, op.28, delo 191, l.2 (ob.).

Surgical Neurology or Neurological Surgery?

In 1927 professor Pavel Iosifovich Emdin (1883–1959),⁸ who was head of the neurological clinic at North-Caucasian University in Rostov-on-Don, published the program paper *Khirurgicheskie Metody v Rukakh Nevropatologa* (“Surgical Methods in Neurological Hands”) (Emdin, 1927). Emdin distinguished two ways to introduce surgical methods into neurology. The first way was neurological surgery when a surgeon of the nervous system becomes a neurologist at the same time. The second way of surgical neurology leads into the opposite direction — from neurology to surgery. According to Emdin, Russian neurology was ahead of other countries in this respect (Bekhterev and Darkshevich were given as examples). In Germany it can be illustrated by a case of O. Foerster. After visiting Foerster’s clinic in Breslau in 1925, Emdin established an operating room at his neurological clinic in Rostov-on-Don. He invited surgeon A. Tzeitlin to help him in operating on neurological patients. During a two-year period 68 operations were performed, including the removal of nine brain tumors. Mortality rate was 20%, but in brain tumors it was 90%. The results were reported at the First All-Union Congress of Neurologists and Psychiatrists that took place in Moscow in December 1927. Some neurologists were critical to Emdin’s appeal to become surgeons. According to Prof. M.P. Nikitin of Leningrad, the two specialties could hardly be combined in one person because surgery is a very difficult field that requires constant exercise while neurology is also a difficult field. Nikitin claimed that ophthalmologists, otologists, and gynecologists managed to learn surgical methods only because their specialties are very narrow whereas neurologists should follow the example of internists who do not operate on their patients.

Emdin argued that it is in patients’ interests to have a neurologist who learned surgical methods of treatment. Every fifth neurologist should learn to operate on his patients, he claimed.

However, only few specialists managed to combine surgery and neurology. In real practice a neurologist did diagnostic studies and then referred patients to a surgeon. According to P.S. Babitsky it is essential to have a close cooperation between a neurologist and a surgeon during all stages of patient’s examination and treatment: “Neurological clinic is impossible without a neurosurgical clinic in the same building because the operating room is an indefeasible part of the neurological clinic similar to the physiotherapy cabinet” (Babitsky, 1934, p. 138). Everyday routine work of a surgeon and a neurologist should help to find the common ground between the two that would be of paramount importance for early radical surgery of brain tumors. Moreover, Babitsky considered neurologists’ duty to minimize neural injury during surgery. A neurologist should insist that a surgeon would avoid the use of a hammer and a chisel during trepanation and use the electro trepan instead. The possibility of blood transfusion is a condition sine qua non for brain surgery.

According to A.I. Geimanovich the term “neurosurgery” is insufficient for grasping the notion of surgery of the nervous system (Geimanovich, 1937). He wrote that some decades ago that neurosurgery was confined to a direct influence upon a pathological process (removal a cerebral tumor or a bone fragment after neural injury). But nowadays, he noted, interventions are guided by the laws of neurophysiology. Foerster’s operation (dissection of posterior spinal cord roots for coping with tabetic crises and spasm) is given as an example of such “physiological” surgery.

⁸Emdin graduated from Kazan University and from 1909 to 1914 worked in Darkshevich’s clinic in Kazan. His doctoral thesis (1914) was dedicated to changes of a skeletal muscle after nerve cutting. In 1924 he headed the nervous clinic at Rostov-on-Don. Surgery of brain tumors was in the center of his interest. Emdin was a pioneer of cisterna magna puncture in the USSR. The school of Emdin included several surgical neurologists who established neurosurgery clinics at neurology departments in the province including Chaim Iosifovich Garkavi in Gorky and David Grigor’evich Shefer in Sverdlovsk.

For several decades both surgeons and neurologists claimed the new domain as their own. Gradually, the battle between surgical neurologists and neurological surgeons was won by the latter (Lichterman, 1998).

The Birth of a Soviet Neurosurgical Clinic in Petrograd-Leningrad

In 1927 Isaac Babchin⁹ wrote:

In Europe and America brain surgery is a stable discipline which has among its representatives such coryphaei as Horsley, Cushing, Frazier, Eiselsberg, Krause, de Martel etc. Each of them removed tens or even hundreds of brain tumors, and Cushing has done more than one thousand cases. On the contrary, in our country [Soviet Union – B.L.] this problem is still in its infancy. The statistics [of brain tumors – B.L.] is nonexistent. We have only casuistic reports from general surgeons.” (Babchin, 1927, p. 946)

According to Babchin, such a situation might be explained by bad diagnostics and reluctance of neurologists to refer their patients to surgeons. Better results of brain surgery and decrease of mortality also depended on a surgical technique that is gained through experience and specialization. Babchin illustrated his paper by 3 cases of posterior fossa tumors and noted that 12 such cases had been operated upon in Polenov’s clinic during last three or four years (see below). He concluded: “The development of brain surgery and brain tumor surgery in particular is possible only in case of *specialization* [italics by Babchin – B.L.] in this field. While this will not be understood and brain surgery will remain in hands of general surgeons (who give it occasional attention and who do not develop a special technique necessary for these operations) it will have no future” (Babchin, 1927, p. 967).

Babchin was an assistant of Prof. A.L. Polenov.¹⁰ In 1933 Polenov published the results of 350 operations on brains and spinal cords.¹¹ He and his coworkers wrote the first Soviet neurosurgical manuals: *Kratky kurs Khirurgicheskoi Nevropatologii* (A Short

⁹Isaac Savel’evich Babchin (1895–1989) graduated from Gosudarstvenny institute meditsinskikh znany (formerly Psychoneurology Institute) in 1924 and worked as an assistant and then as head of the neurosurgery department at Polenov’s Traumatology institute. From 1938 to 1960 he was deputy director of the Polenov Neurosurgery institute in Leningrad, and from 1947 to 1970 he held the chair of neurosurgery at the Kirov Postgraduate State Medical Institute (GIDUV).

¹⁰Andrei L’vovich Polenov (1871–1947) graduated from the Imperial Military Medical Academy in 1896 and worked as a military surgeon first in Orel, then in Kronshtadt (near St. Petersburg). In 1901 he was awarded a doctoral degree for his thesis “Sympathectomy and its Influence on Experimental Epilepsy in Animals.” In 1904 he was sent to France and Switzerland to visit surgical clinics. Since 1910 he worked as privat-docent at Imperial Military Medical academy at a hospital surgery clinic of Prof. Sergei Fedorov. In 1914 he was appointed professor of general surgery at the Psychoneurology Institute. In 1917 Polenov founded an Institut Fiziokhirurgii (Institute for Physiosurgery) aimed at the treatment of wounded warriors by combining surgical and physical methods. It consisted of 140 beds and three departments —traumatology, orthopedics, and neurosurgery. A.G. Molotov (see below) and M.P. Nikitin (see above) were consultant neurologists there. In 1918 Polenov founded the first chair of traumatology in Russia. In 1924 the Institute of Physiosurgery merged with Institute of Orthopedics to become the Petrograd (later Leningrad) State Traumatology Institute. Polenov was appointed institute director. However, in 1931 he left his directorship and remained head of the neurosurgery department.

¹¹During a 15-year period, 1086 operations on the nervous system were performed at the neurosurgery clinic headed by Polenov at Central State Institute for Traumatology. It included 380 cases of brain surgery (mortality rate 20%), 264 operations on spinal cord (mortality 10%), and 442 operations on peripheral nerves (Bryusova & Kornysky, 1937).

Course of Surgical Neurology) (1935) and *Kratky kurs Tekhniki Operatsy na Perifericheskoj i Tsentral'noj Nervnoj Sisteme* (*A Short Course of Surgical Techniques for Operations on Peripheral and Central Nervous System*) (1937). Polenov considered the formation of neurosurgeons a priority. In 1935 he established the first chair of neurosurgery at the Leningrad State Postgraduate Institute for Physicians (GIDUV).¹²

In 1926 the first Institut Khirurgicheskoi Nevropatologii (Institute for Surgical Neurology) was founded in Leningrad by Bekhterev's pupil Alexei Gavrilovich Molotkov (1874–1950).¹³ He was supported by S.P. Fedorov — professor of surgery who was invited by Molotkov to become institute director in 1929 (Molotkov himself became deputy director). This institute demonstrated the first experience of scientific cooperation of three departments: 1) clinical (70 beds); 2) experimental (including biochemistry lab, clinics, vivarium, etc.), and 3) pathology department with a special laboratory for neuroanatomy and neurohistology (Molotkov, 1927). During the first year, 287 cases were operated on, mostly peripheral nerve lesions (43 CNS lesions and 244 operations on peripheral nerves). Molotkov advocated neurotomy for neurotrophic disorders. During this year, 755 experiments on the impact of denervation on inflammatory and neoplastic processes were performed using 710 animals (Molotkov, 1927).

Surgery of peripheral nerves and neurodystrophic processes, as well as pain surgery, were dominant in the scientific agenda of Molotkov's institute. The experimental department was headed by A.D. Speransky who published his book on the role of nervous system in pathology in 1930 followed by his famous monograph *Elementy Postroeniya Teorii Meditsyny* (*A Basis for the Theory of Medicine*) (Speransky, 1935).

In 1935, 485 patients were hospitalized in this institution and 380 were operated on. Postoperative mortality after brain surgery was 35% (compared to 78% in 1934).¹⁴ In 1936, the 36-year-old neurologist, Maks Solomonovich Skoblo (1899–1963) became an Institute director, but soon he was dismissed.

In 1938 the Institute for Surgical Neurology merged with the neurosurgery clinic of the Traumatology Institute that resulted in the formation of the Leningrad Neurosurgical Research Institute. Polenov became institute director and Babchin became his deputy responsible for research. The number of beds was doubled (140) and there were five departments: head and spinal injury, peripheral nerve surgery (headed by Molotkov), vegetative nervous system surgery, male and female neurooncology. In 1945 A.L. Polenov and A.V. Bondarchuk published *Atlas Operatsy na Golovnom i Spinnom Mozge* (*An Atlas of Operations on Brain and Spinal Cord*) that was awarded the Stalin Prize of the first degree (Polenov, 1945). After Polenov's death his institute was headed by V.N. Shamov (from 1945 to 1956).¹⁵

¹²A private course on neurosurgery was already started at GIDUV by Polenov in 1927.

¹³Since 1918 Molotkov worked with Pussep at Neurosurgery Institute in Petrograd. He became a professor in 1935 and *zasluzhennyi deyatel' nauki* (honored scientist) in 1947.

¹⁴Pasport Instituta khirurgicheskoi nevropatologii Leningradskogo gorzdravotdela (1936). GARF, fond A-482, op.28, delo 196, list 15.

¹⁵Vladimir Nikolaevich Shamov (1882–1962) graduated from the Imperial Military Medical Academy in 1908. In 1913 he was sent to the United Kingdom and the United States for scientific training. In 1913–1914 Shamov worked at Cushing's laboratory of experimental surgery at Harvard University for six months. After WWI was declared, Shamov returned to Russia and worked as assistant and then as privat-docent at the Military Medical academy. In 1923 he became a professor of surgery at Kharkov medical institute. In 1930–1931 he directed the Ukrainian Institute for Hematology and Blood Transfusion. In 1939 he chaired the surgery clinic at the Kirov Military Medical Academy in Leningrad. In 1943 he was appointed deputy surgeon-in-chief of the Red Army. Shamov was a pioneer of electrosurgery in the USSR and was the first Soviet surgeon who reported the removal of tumor of the lateral ventricle (in 1933). He suggested periarterial sympathectomy for treatment of spontaneous gangrene (See personal file of V.N. Shamov at the Archive of the Burdenko Neurosurgery Institute, Moscow, Russia).

The Birth of the Neurosurgery Clinic in Moscow

In 1918, Moscow became the Russian capital instead of Petrograd. The strict centralization of all spheres of life is characteristic for totalitarian states. Medical sciences were no exception. The development of neurosurgery in Moscow was determined by two people — the surgeon Nikolai Nilovich Burdenko¹⁶ (1875–1946; Figures 2 and 3) and the neurologist Vasily Vasil'evich Kramer¹⁷ (1871–1935; Figure 2).

In 1929 Kramer and Burdenko opened a 25-bed neurosurgery clinic at the State Institute for Roentgenology. In October 1931 the Sovnarkom (Soviet government) issued a special decree on reorganization of this clinic into the Neurosurgery Institute. However, it was only in 1934 when a newly founded institution got its building on *ulitsa* (street) *Ul'yanovskaya* and was transformed into *Tsentral'ny Nauchno-Issledovatel'sky Institute Neurokhirurgii* (the Central Research Institute for Neurosurgery) with 100 beds.

According to the draft of the “Status of the State Central Research Institutes of Narkomzdrav RSFSR (Ministry of Health of Russian Federation)” central institutes had to control provincial research institutions. *Aspirantura* (a three-year research fellowship for writing *kandidatskaya dissertatsiya* — a sort of Ph.D. thesis — B.L.) had been established at central research institutes. A hierarchy of research workers was installed: *mladshy nauchny sotrudnik* (junior research associate), *starshy nauchny sotrudnik* (senior research associate), and *deistvitel'ny chlen* (active member) of the research institution. Central institutes were also allowed to launch their journals or bulletins. A Scientific Council (an advisory organ to an institute director constituted of heads of departments and representatives from *aspirantura* and interns) had to be formed (Anonym, 1935).

Main points of the above cited document were put into practice at the Central Research Institute of Neurosurgery. Since 1935, the Neurosurgical Council (established at the Institute in 1934) had its annual sessions. In 1937 Burdenko founded a quarterly journal *Voprosy Neurokhirurgii* (*Problems in Neurosurgery*) (which had circulation 500 copies) — the second neurosurgery periodical in the world (the first was *Zentralblatt für*

¹⁶Burdenko, who was nicknamed “father of Soviet neurosurgery,” was born into the family of a village clerk. Upon graduation from *seminarija* (a training school for Orthodox priests) in Penza, Burdenko became student of the medical faculty at Tomsk University in Siberia. Burdenko was expelled from the university three times and finally graduated from the medical faculty of Yur'ev University (the present Tartu University, Estonia). He became a pupil of V.G. Tsege Manteifel — a professor of surgery at this university. Burdenko suggested treating communicating hydrocephalus with omentum. He also performed 35 cases of bulbotomy — the cutting of the extrapyramidal tracts in the brainstem for treatment of postencephalitic hyperkinesias (the operation was first done experimentally by his pupil B.N. Klosovsky). In 1924 Burdenko became director of the surgical clinic (*klinika fakul'tetskoi khirurgii*) at the First Moscow State University. From 1932 until his death in 1946, he was president of the All-Union Association of Surgeons. In 1937 he became deputy of the Verkhovny Sovet (Soviet parliament) and in 1939 he became a member of the Soviet academy of Sciences, joining the VKP (b) (the Communist Party of USSR). On August 1, 1941 Stalin appointed him surgeon-in-chief of the Red Army. He became general-colonel of the military medical service and was awarded the honorary title of Hero of Socialist Labor. Burdenko became the first president of Academy of Medical Sciences of USSR founded in 1944. He died after repeated strokes and suffered from aphasia. Shortly before his death he wrote the following note: “It is worth living only while you are working; if you do not work, there is no reason to stay alive.”

¹⁷Vasily Kramer graduated from medical faculty of Moscow University in 1900 and for ten years worked at the neurological clinic of his alma mater. Subsequently he became an assistant of Prof. L.S. Minor at the neurological clinic of Vysshie zhenskie kursy (a newly established Women's University in Moscow). In 1920 he became professor and started to work at Moscow Institute for Psychoneurology. He was among the group of physicians (which included O. Foerster) who treated Lenin after his stroke.



Figure 2. N.N. Burdenko (second from the left) and V.V. Kramer (first from the right) looking at equipment of the clinic (Moscow, 1929, photo from the Russian State Archive of Cinema and Photo Documentation [RGAKFD], ac. Number 272282).

Neurochirurgie launched in Berlin in 1936). Young neurosurgeons were formed through 1) *aspirantura* and 2) the establishment of chairs for neurosurgery at Postgraduate Medical Institutes (relevant chairs were established in Leningrad by Polenov (see above) in 1935 and by Burdenko in Moscow in 1938).

What were the characteristics of the Moscow school of neurosurgery? According to Burdenko, each neurosurgical operation “should be performed with the accuracy of an approved physiological experiment.”¹⁸ He wrote that neurosurgery is unique “in terms of following the guidelines of the [Communist] party and [Soviet] government aimed at the creation of human physiology” (Burdenko, cit. by Klosovsky, 1947, p. 41).¹⁹

¹⁸The case of Burdenko’s pupil L.M. Koreisha might serve as a good illustration of a close link between physiology and neurosurgery in the interwar period. Leonid Aleksandrovich Koreisha (1896–1973) graduated from medical faculty of Moscow University in 1919 and was trained in general surgery under I.K. Spizharny and N.N. Burdenko. From 1927 to 1929 Koreisha was an assistant of Prof. Lina Shtern at the chair of physiology of the Second Moscow Medical Institute. In 1930–1932 he headed the pathophysiology department at Medico-Biological Institute and at the same time practiced surgery at a university clinic. From 1933 to 1940 Koreisha headed both surgery and physiology sectors at the Central Institute for Neurosurgery in Moscow. In one of Koreisha’s characteristics (dated 1952) he was named as one of the greatest pupils of N.N. Burdenko, who “perceived from Burdenko the idea of the importance of neurosurgery for the development of human physiology and pathophysiology” (See personal file of Koreisha at the Archive of the Burdenko Neurosurgery Institute, Moscow, Russia).

¹⁹The same phrase is written in the editorial introduction to the first issue of *Voprosy Neurokhirurgii* (Anonym, 1937).



Figure 3. Burdenko at an operating theatre (photo from the 1930s, Museum of the Burdenko Neurosurgery Institute, Moscow).

Moscow neurosurgery might be characterized as biological: “The biological approach to disease process in the life of the whole organism inevitably results in a complex method of our work” (Anonym, 1939).²⁰ The principle of multidisciplinary examination of a patient (*kompleksnost'*) was claimed to be a characteristic feature not only of Soviet Neurosurgery but also of Soviet medical science in general. Another basic feature was *plano-vost'* (planned character of a clinical research).²¹ In neurosurgery practice *kompleksnost'* meant that each neurosurgery patient had to be examined by different specialists — a neurologist, an ophthalmologist, an otologist, a radiologist, etc. This principle was reflected in the structure the Central Institute of Neurosurgery. Apart from several neurosurgery departments the Institute had neurology, neuromorphology, and neurophysiology sectors, a radiology department, different laboratories and a vivarium for experimental animals.

By the mid-1930s Burdenko formulated three principles of neurosurgical interventions: 1) anatomical availability, 2) physiological permissibility, and 3) technical possibility. The latter (technical possibility) meant dexterity of a surgeon (Burdenko, 1937). According to Burdenko, 2500 patients with brain tumors were seen at the Central Institute of Neurosurgery between 1929 and 1938, and 1500 of them were operated on. In 1944 Burdenko mentioned 4000 operations for brain tumors performed during a 15-year period.²² The institute

²⁰Citation from an anonymous obituary of Harvey Cushing in *Voprosy Neurokhirurgii*. Most likely the text was written by Burdenko, who edited this journal (Anonym, 1939).

²¹It should be mentioned here that since the late 1920s there were five-year plans of economy development (*pyatiletka*) in USSR. Burdenko adapted this principle of centralized planning to medical science.

²²However, at a meeting of Praesidium of Ucheny Meditsynsky Sovet (UMS) on October 29, 1938, Burdenko gave another figure: “In 15 years, our Institute performed 1450 neurosurgical operations, [including] 580 operations on the central nervous system” (Burdenko, 1938, p. 29).

activity booklet of the period 1929–1940 (published in 1944 or 1945), states correct preoperative neurological diagnosis in tumors of brain and spinal cord in 86% of cases. The results of surgery of tumors of the IVth ventricle were not very optimistic: 116 cases were operated on and 50 of them died after surgery (Anonym, n.d.).²³

There were about hundred neurosurgeons in USSR by 1939 (Burdenko, cit. by Bryusova, 1947).²⁴ Most of them belonged to Moscow school of neurosurgery. Andrei Andreevich Arendt (1890–1965) established a department of pediatric neurosurgery in 1946 and wrote a classical monograph on hydrocephalus and its surgical treatment (Arendt, 1948). Leonid Aleksandrovich Koreisha (Figure 4) was a secretary of *Ucheny meditsynsky sovet Narkomzdrava* (National Scientific Council at the Ministry of Health) and is known for his physiological research in neurosurgery clinic. Boris Grigor'evich Yegorov (1892 – 1972) became the institute's director in 1947. He is known for his monograph on acoustic neurinomas (Yegorov, 1949). Alexander Ivanovich Arutyunov (1904–1975) organized a neurosurgery institute in Kiev in 1950 and in 1964 succeeded Yegorov as the director of the Burdenko Institute in Moscow.

A school of neurologists was also formed at the Neurosurgery Institute in Moscow in the 1930s. It included V.V. Kramer, M.Yu. Rappoport, Yu.V. Konovalov, A.Ya. Podgornaya, L.O. Korst, etc. This neurological school specialized in topical diagnosis. Soviet



Figure 4. L.M. Koreisha (first from the left side) in an experimental lab (photo from the early-1930s, Museum of the Burdenko Neurosurgery Institute, Moscow).

²³According to L.O. Korst (Korst, 1937) 34 cases of acoustic neurinomas were operated on at Neurosurgery institute during six years; 13 of them died after surgery. Their results of surgery for cerebellar tumors were also grim: out of 37 cases 9 patients died before surgery and only 11 patients (out of 28) survived after surgery.

²⁴This number might be increased five fold if traumatologists dealing with head injuries are included. At that moment there were about 120,000 physicians in the USSR including 12,000 surgeons.

neuroophthalmology (B.N. Blagoveschensky, A.V. Skorodumova, A.Ya. Samoilov), otoneurology (G.S. Zimmerman, O.S. Ageeva-Maikova), neuropathology (A.S. Chernyshov, B.N. Klosovsky, B.N. Mogil'nitsky, S.M. Blinkov, L.I. Smirnov), neurophysiology (P.K. Anokhin, V.A. Negovsky, V.S. Rusinov), and neuroradiology (M.B. Kopylov, N.N. Althausen, A.M. Kun) were also born at this institute.

An important role in the emergence of Soviet neurosurgery was also played by provincial neurosurgery clinics in Postov-on-Don (P.I. Emdin), Khar'kov (Z.I. Geimanovich), Gorky (Ch.I. Garkavi), and Sverdlovsk (D.G. Shefer).

Conclusions

Neurosurgery in Russia initially developed as surgical neurology. It was promoted by the neuro(patho)logist Vladimir Bekhterev, who opened an operating room at the neurological clinic of the Imperial Military Medical Academy at St. Petersburg and encouraged his pupil Ludwig Pussep to become a surgical neurologist. WWI stimulated the emergence of a new specialty due to the large number of patients suffering from cranial, spinal, and peripheral nerve injuries. Polenov's neurosurgical clinic at the Physiosurgery Institute in Petrograd, Molotov's Institute for Surgical Neurology in Leningrad, and the Central Institute for Neurosurgery in Moscow (1934) were catalysts of the development of neurosurgery as a complex specialty and determined other factors of its formation (*distsiplinoo-brazuyushchie factory*)²⁵ such as the creation of the Neurosurgery Council, launching a specialized periodical *Voprosy Neurokhirurgii*, and organization of chairs of neurosurgery at postgraduate medical institutes. Initially neurosurgeons were recruited both from surgeons and neurologists but surgical neurology had been gradually replaced by neurological surgery.

The new discipline was regarded (by H. Cushing in the United States, C. Vincent in France, and N.N. Burdenko in the USSR) as a sort of applied neurophysiology. Soviet neurosurgery is best characterized by its *kompleksnost'* — that is the concentration of several auxiliary disciplines within one research institution (neurosurgical institutes in Moscow and Leningrad). This resulted into the emergence of new clinical neurosciences such as neuroradiology, otoneurology, neuropsychology, etc.

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²⁵This term is suggested by me and literally means “factors that form a specialty.” If neurosurgery (or any other medical specialty) is viewed as a system, then we might distinguish elements or factors (social, scientific, and institutional) that shaped (or constructed) the specialty. Further discourse on specialization in medicine is beyond the scope of this paper.

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