

On the biography of Professor M.S. Makarov (1906–1977)

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On the basis of archival documents, information about the life of the surgeon, traumatologist, orthopedist and cytologist Professor M.S. Makarov (1906–1977) is presented. His work has been inextricably linked with the Stavropol Territory. Makarov organized the provision of specialized orthopedic and trauma care to the population of Stavropol and was a leading expert in this field. The authors note the multifaceted nature of his scientific interests. Makarov had extensive surgical experience; he worked as a doctor and as the head of the orthopedic department at the Stavropol boarding school for children with orthopedic trauma pathology. During World War II, he led a military hospital's surgical department for the seriously wounded. Makarov, together with the well-known microbiologist Professor M.P. Prokrovsky, developed a cytological method for studying granulating wounds by creating contact preparations, which became widely used in hospitals, as it significantly facilitates the evaluation of the healing process. Makarov's teaching activities are associated with the Faculty of Orthopedics and Traumatology at the Stavropol State Medical Institute, which he participated in creating, and which he headed for many years. The authors describe the main points in the treatment methods for tuberculosis kyphosis, provide information about (Makarov's) method for an open reduction of congenital dislocation of the hip in children with preservation of the cartilage of the acetabulum. Makarov's contribution to the development of domestic cytology is noted. The article recalls the scientist's most significant works. Makarov's contribution to the development of domestic orthopedics is noted. It is concluded that he has made a significant contribution to the development of traumatology, orthopedics and healthcare in the Stavropol Territory. The article uses extensive materials from the archive of the G.N. Prozritelev and G.K. Prave Stavropol State Museum-Reserve, the Stavropol Territory State Archive and the Museum of the History of the Stavropol State Medical University.

Keywords: *M.S. Makarov, treatment of gibbosity, bone tuberculosis, cytology of wound exudate, contact preparation methods*

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Alongside famous figures in medicine, one can name many names of great scientists and doctors that linked their fate to their native land and lent their strength to the development of regional medicine. One of these is Mikhail Makarov (1906–1977; Fig. 1), an outstanding

Soviet surgeon, orthopedist, traumatologist and cytologist, whose activities were inextricably linked with the history of the Stavropol Krai [1–3]. On the basis of archive materials from the funds of the G.N. Prozritelev and G.K. Prave (SSMR) Stavropol State Museum-Reserve, the State Archive of the Stavropol Territory, Archives and Museum of the History of the Stavropol State Medical University (SSMU), the purpose of this article is to produce a creative biography

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of M.S. Makarov and reflect his contribution to the development of medicine in the Stavropol Krai.¹

M.S. Makarov was born on October 2, 1906 to a working-class family of many children. His career began in 1931 as a graduate of the Rostov Medical Institute (Fig. 2). As a young professional he first worked as a surgeon at the hospital in the Komintern mine of the Shakhty district of the Rostov region. A year later he was drafted into the Red Army, and for eight months served as a doctor in the 220th infantry regiment, which was based in Novocherkassk. In 1933, he returned to the mine, and from August 1936, became the head of the surgical department of a hospital in Kalach-Nadon. In 1933 Makarov's fortunes allowed him to attend a scientific mission in Leningrad and achieve a specialization in the courses of Orthopedics and Traumatology at the R.R. Vreden Research Institute. This trip largely determined his fate as a doctor.

In 1936 Makarov returned to Stavropol. His path to universal recognition began with the creation of an orthopedic hospital with the support of the Narkomsobes² Boarding School, which was attended mostly by children from 8–15 years of age with the most severe forms of paralysis. One of his patients was a twenty-two-year-old man who had spent the last 19 years moving with short crutches, his body tethered to a seat. He experienced serious spasms of the muscles in the arms and legs. He required surgery

¹ In prerevolutionary Russia, only a few doctors who worked mainly in Saint Petersburg, Moscow, Kharkov and other cities, provided limited orthopedic and trauma care to the population. Specialized assistance to the populations of provincial cities such as Stavropol was not provided. In the first years of Soviet authority, the few qualified surgeons in Stavropol (such as A.M. Grigoriev, who worked in Stavropol, and I.I. Toshinskiy, who worked in Pyatigorsk) performed the surgical treatment of orthopedic and trauma patients. Things began to change once the young surgeon Makarov returned to Stavropol in 1938 [4].

² Narkomsobes – People's Commissariat Of Social Security.

for autologous transplantation of certain muscle groups (hip flexors, hip adductors to the hip abductors and vice versa). Makarov was able to perform the operation. A few months later the man began to walk and soon afterwards began to work [5].

Another patient suffering from encephalitis developed persistent spastic paralysis of the neck (the head, which was cast far back, lay between the shoulder blades). He could see only the rear wall and ceiling. Makarov performed three operations – on the nerves, muscles and bones. Even the most complex surgical treatments were carried out in the best way: The bone blocks in the cervical spine area had become too hard to maintain the patient's head and get rid of torture [6].

An uncommon level of mastery and boundless dedication was required to make the disabled able-bodied.

In a short time, Makarov's office was filled with dozens of plaster copies of wretched body parts and hundreds of pictures of patients before and after treatment. Only in 1939 was the ability of 103 disabled patients to work restored, 14 of whom could barely move around their home or get out of bed.

The creation of the orthopedic department at the Stavropol Boarding School was the beginning of the provision of specialized orthopedic and trauma care in the Stavropol region, and that was to Makarova's credit. This institution was the second in the RSFSR to open (the first was opened in Peredelkino, outside Moscow) [4].

At the beginning of World War II, Makarov organized and headed the surgical department for seriously wounded in the 1626 military hospital, which was located in the Agricultural Institute building. The surgeon was required not only to expand and equip the department with 260 beds, but also to introduce a course for doctors and nurses, as most of them had no experience not only with trauma, but even surgery.

In the early days of the war, Makarov met microbiologist Professor Magdalena Pokrovskaya



Fig. 1. Prof. M.S. Makarov. Beginning of the 1960s.
(Foundation of the Museum of History SSMU).

at the hospital, who offered her expertise in the treatment of lesions caused by bacteriophages. Even then, knowing full well how great the number of treatments and the number of drugs for the treatment of wounds were, Makarov began to seek out new, more rational ways. He was particularly interested in the problem of assessing wound healing, as on the basis of subjective experiences of different medical conditions of the same patient could be assessed in different ways. A study on histological sections was due to the need for the surgical biopsy, which could not be done often.

Makarov became the author of a cytological study of granulating wounds by making fingerprint preparations. Wound and pus were removed from the surface of the wound with a cotton ball and a sterile glass slide, on which were prints of the surface layer cells of the wound, was subsequently placed from granulation tissue to different parts of the wound. The method was completely harmless, and drugs and fingerprints could be obtained each time the wound was dressed. The new method, developed in conjunction with M.P. Pokrovskaya, was first

described in the newspaper “Medical Worker”, and in 1942, was published in a monograph as “Cytology of wound exudate as an indicator of wound healing” [7]. The chief surgeon of the Red Army, academician N.N. Burdenko praised this method highly. He also praised Makarov and other well-known domestic surgeons: Professors S.S. Girgolav and I.G. Rufanov. The Makarov and Pokrovskaya method became widely used in hospitals.

Makarov’s department worked with those afflicted with anaerobic infections, injuries of the musculoskeletal system, fractures of the extremities, joint injuries, and burns of major vessels. The days during which patient reception levels were highest were the most intense. Upon completing emergency care, the department engaged in routine operations and current therapeutic work.

Blood transfusions for the wounded had to be taken from donors who had to be called to the hospital from the city. In urgent cases, employees of the department assumed the role of doctor (they donated blood twice a month and continued to perform their duties).



Fig. 2. M.S. Makarov during his studies at the University of the North Caucasus. Around the 1930s.
(Archive of Stavropol State Museum Preserve).



Fig. 3. M.S. Makarov performing scientific work.
The second half of the 1940s.
(Archive of the SSMU Museum of History).



Fig. 4. M.S. Makarov during the cytological study.
(Archive of the SSMU Museum of History).

Some patients were inevitably lost. Despite the best efforts of doctors, due to anaerobic cellulitis after a deep pelvic gunshot wound, gas gangrene of the hip and tibia as a result of firearm-caused fracture of the hips and damage to the popliteal artery, despite the best efforts of doctors, a frontline surgical nurse died of her wounds.

However, according to Makarov's memoirs, there were more happy days than tragic ones. One patient, a young man named Vanya, was brought into the hospital along with the first echelon of the wounded from Donetsk with a gunshot wound to the skull, a fever of 39°C and completely unconscious. After an examination by a neurologist and a skull x-ray, it was revealed that his brain injury—encephalitis—was actually a foreign body in the posterior fossa. There were neurosurgeons among the staff in the state hospital, and it became necessary to operate on their own. After trepanation deep beneath the cerebellum, a metal fragment was found near the medulla oblongata, measuring 3×2 cm. They managed to remove it. It was the first such successful operation carried out in the department.

The department received another difficult patient: a young man, discharged from the military due to an aneurysm of the right carotid artery caused by a bullet wound. He complained of severe pain in the neck region, on the right side

of which, in the submandibular region, a tumor larger than a fist, throbbing, purple-red, and of a tight-elastic consistency was discovered. The skin coating the tumour glistened as though lacquered; it was tense and could explode at any moment. Makarov suggested carrying out the operation immediately. Doctors managed to remove the aneurysm and prevent bleeding.

Treating the injured with gunshot injuries of the joints was particularly difficult. Before the “era of antibiotics”, surgeons had to work substantially to treat patients with the purulent joint disease. Only with arthrotomy (the wide opening of the joint cavity) — and in the absence of any effect — resection of the affected part and the closure of the joint (arthrodesis surgery) were they able to save the lives of the soldiers.

Makarov's colleagues successfully dealt with their responsibilities; when inspecting the main trauma hospital of the country, professor N.N. Priorov, praised the work of the staff department headed by Makarov.³

In the beginning of August 1942, Makarov fell seriously ill; he was diagnosed with ulcerative gastric bleeding, thus the evacuation of Stavropol

³ Makarov M.S. Brief information on the working of the hospital 1626 during the Great Patriotic War years [Manuscript]. Museum of the History of Stavropol State Medical University. M.S. Makarov Fund no number. L. 1–6.

was out of the question. During the occupation, Makarov did not leave his young patients from the children's boarding school and also worked at the city hospital.

After the liberation of Stavropol in 1943, this extraordinary surgeon was appointed chief physician and director of the Therapeutic Boarding School for the Disabled of the Great Patriotic War. In 1946, the publication of his new scientific work "Prosthetic Lower Limbs the Rules of their Use" [8] (Fig. 3).

Makarov continued his research in the field of cytology (Fig. 4). He used the previously developed method of drug-prints for the study of tumor morphology. On February 1, 1946, he became the assistant of the department of hospital surgery at the Stavropol Medical Institute, and on April 16, 1946, at the Central Institute of the Betterment of Doctors, he defended his Ph.D. thesis on the "Cytological diagnosis of tumors by the fingerprint method".⁴

In 1953, Makarov was elected by contest to the post of associate professor of hospital surgery. The day before, serious questions from his colleagues awaited him at a meeting of the scientific council, but not on the course of his research, but whether he had treated German soldiers and officers during the occupation.⁵

In the 1950s, the associate professor of hospital surgery clinic M.S. Makarov was spending long periods of time (from several weeks to months) in the Molotov Osteo-tuberculosis Hospital (now Krasnogvardeiskoe), where he trained local surgeons in the technique of bone-plastic operations.⁶ Thus, in 1953, within 30 days of stay in the hospital, he performed 31 surgical interventions on patients with osteoarticular tuberculosis.

Engaged in orthopedics and traumatology, Makarov paid particular attention to the problem of the cytological monitoring of wound healing. He proved that not only the lymphocytes and

monocytes, but also granulocytes form the elements of connective scar tissue in wound healing. He was able to observe the transformation of macrophages (granulocytes) into macrophages (mononuclear monocyte cells). Makarov's experiments were based on an original method; he did not study multilayered tissue section, rather preparations of a single layer of cells obtained during hourly wound studies.

In 1954, Makarov met with academician S.S. Yudin, who became interested in the writings of the Stavropol scientist. On June 8, 1954, on the order of the Ministry of Health of the RSFSR, Makarov was appointed senior researcher of the Sklifosovskiy Moscow City Research Institute of Emergency Medical Care. However, after Yudin's sudden death, Makarov decided to stay in Stavropol.

As a surgeon, Makarov conducted many complex operations on tumors in the chest, abdomen and kidney. From 1958, he practiced surgical interventions against tuberculous spondylitis, many of which he did at the Krasnogvardeyskaya hospital [9].

On July 20, 1962, the pioneer surgeon performed the first operation for the treatment of tubercular kyphosis, a gradual treatment. It began with the removal of most of the destroyed vertebral tuberculosis, thereby creating kyphotic mobility. Following the operation, the patient was laid on his stomach (during interventions on lumbar and mid-thoracic areas) or on his side (after surgery of the thoracoinferior and thoracolumbar region). In one such state, patients were forced to lie for about 10 days (prior to suture removal). Usually, on the 12th day, the patient was turned on his back, and into the area of the hump was underlaid a small roller. For reclination, a passive loop-belt made of soft durable fabric was proposed, which hung over the mattress at a distance of 10–15 centimeters. The patient was placed on a belt with the hump facing downward. Under the weight of the body, the spine began to unbend slowly. The loop-belt was then gradually raised. At the same time, they carried out an active spine reclination with special gymnastic exercises, which became more difficult with time. The correction lasted 1–2 months.

At the final stage, after the maximum possible reduction of kyphosis, another surgery –

⁴ Stavropol State Medical University Archive. F. R-2431. Op. 2A. D. 3553. L. 19, 76.

⁵ The State Archive of the Stavropol Region. F. R-2431. Op. 6. D. 56. L. 1–2.

⁶ One of the doctors of this hospital, B.G. Rusanov, would become head of the surgical department at the Moscow Regional Bone and Tuberculous Hospital, and the doctor I.B. Sarkisov would head the Bone and Tuberculosis Sanatorium in Pyatigorsk.



Fig. 5. M.S. Makarov in the operating room.
Assistant – V.G. Mosiyants, scrub nurse – G.M. Nasteko.
Stavropol, 1966.
(Archive of the SSMU Museum of History).

spinal fusion, i.e. spinal fixation in the optimal position – was performed. Makarov improved the previously-known correction methods using three spinal bone autografts (previously only two were used). An autograft was sawed from the tibia. Two of its fragments were placed on both sides of the spine at the site of dissection. The third graft was used to close the defect in the spinal canal. For five months after spine fixation surgery the patient lay in bed, after which he was placed in a plaster corset. The final stage of the treatment took place in a few months, most often in the osteo-tuberculosis sanatorium.

Makarov performed thirty such operations (Fig. 5), which became the basis of his new research. Of all the above cases, only the two associated with concomitant complications resulted in death. In 25 patients, the outcomes of the complex treatment of tubercular kyphosis were positive [10]. At that time, the described method of treatment was seen as innovative. Currently, it is occasionally used by doctors and vertebrologists.

“For great achievements in the field of protection of the health of the Soviet people, the development of medical science and the medical industry”, the USSR Supreme Council Presidium Decree of December 2, 1966 awarded Makarov the highest government award – the Order of Lenin [11].

In 1967, Makarov concluded work on his doctoral thesis on the “Complex treatment of kyphosis with tubercular spondylitis of large pressure” [12] (Fig. 6; appendix). His scientific advisers were professors Y.S. Gilevich and Ph.D. A.I. Kazmin. His defence was held on November 24 in the Central Research Institute of Traumatology and Orthopedics [13]. By the committee’s decision, on May 31, 1968, Makarov was awarded the degree of Doctor of Medicine. By 1972, the surgeon performed another 13 such operations. In 1972, according to the materials of the dissertation and on the basis of new investigations, in the publishing house “Medicine”, he published his monograph “Comprehensive treatment of kyphosis of tubercular origin”.

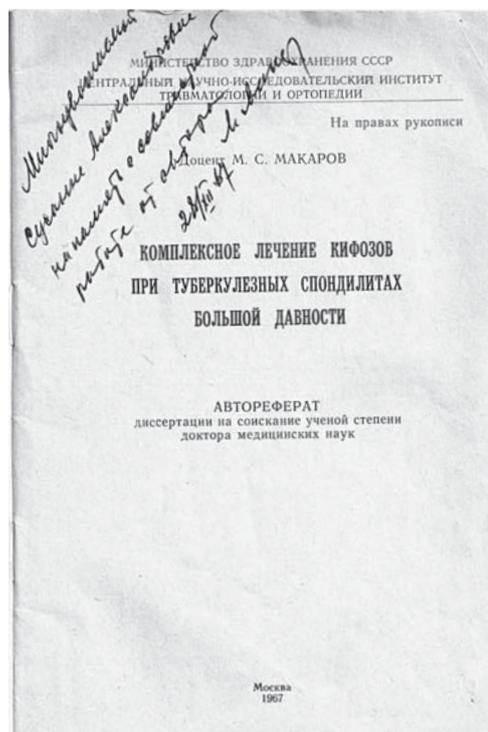


Fig. 6. The title page abstract of the dissertation of M.S. Makarov with an inscription of S.A. Krylova.
(Archive of the SSMU Museum of History).

One of Makarov's important contributions in orthopedics was the development and implementation of a new method of open reduction of congenital hip dislocation in children with the preservation of acetabular cartilage (1967). The basic principle of the treatment of such patients was the maximally careful conducting of surgical interventions. This new technique allowed for a significant reduction in the number of postoperative complications, and the production of persistently good results. In 1970 the method was included in the plan of the Ministry of Health of the RSFSR on the introduction of scientific achievements in medical practice.

Continuing his cytological studies, Makarov, between 30 September – 2 October 1968, at a symposium on the issue of metaplasia, which was held at the Institute of Developmental Biology, USSR Academy of Sciences, reported on the results of his study of the phenomena of metaplasia by intravital observations of leukocyte individual cells in vitro. The report was prepared at the request of the symposium organizing committee and published in the collection by the publishing house "Science" [14].

In October 1967, the Stavropol Medical Institute released a petition to the Ministry of Health of the RSFSR for the establishment of the Department of Traumatology and Orthopedics. In March 1968, the Union Society Board of Orthopaedic Trauma supported the institute's petition and recommended Makarov to head the department.

In April 1969, Makarov was elected to the post of professor of surgery for courses of hospital traumatology and orthopedics, and in January 1970 – to head the Department of Orthopedics and Traumatology. Due to his age, he did not receive approval for his position on full-term basis: because of his outstanding merits, his term as head of the department was prolonged annually. On January 7, 1971, Makarov was approved for the academic title of professor of the department of surgery (Fig. 7).

Working as the head of the department allowed Makarov to attract to his research his followers: assistant professor I.K. Shtilkind, assistants V.G. Mosiyants, T.M. Erokhin, G.G. Tkachev, Y. Panfilov, P.F. Savchenko, and the department heads V.N. Belous, S.A. Krylov, Yu.A. Demidov, E.L. Apaguni and B.N. Supnitskiy.



Fig. 7. Professor M.S. Makarov at a lecture. 1971.
(Archive of Stavropol State Museum Preserve).

In 1975, Makarov published a monograph in the Stavropol book publishing house "Role of granulocytes in the inflammatory process of regeneration according to comparative cytology research" [15]. A pupil of Makarov, V.G. Mosiyants, recalls how when Japanese who had heard about the work of Makarov in the area arrived in Stavropol, they asked the management to show them Makarov's laboratory, but because the cytologist Makarov worked at home, the guests' request was declined; citing that Makarov was currently on a business trip.

Many years of intense work affected Makarov's health. And on November 15th, 1977, due to illness, he retired, and on December 27th he passed away.

M.S. Makarov made a significant contribution to the development of health care in the Stavropol Territory, providing highly specialized orthopedic and traumatic care. Thanks to his efforts, an orthopedic department in a children's boarding school, the Stavropol Regional Clinical Hospital, and the Department of Orthopedics and Traumatology in the Stavropol Medical Institute, providing training and established courses training of orthopedic trauma were opened. Thousands of patients, due to the unique vertebrectomy operations developed and conducted by Makarov, became healthy people. Makarov's techniques forever entered the annals of orthopedics, traumatology and cytology. Even at the present level of medical development, some of them have not lost their relevance.

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APPENDIX

Case Study 1

(from “Short Histories of Illness”)⁷

Patient D-ykh V., age 15, student, history of illness 1577, admitted to the 4th Stavropol City Hospital *Department of Traumatology and Orthopedics*, 07/05/1962, for tuberculosis of the lumbosacral spine and fistula. Length of illness – 13 years.

Observation: An irregular build, shortened torso; a gibbus is located at the L2 – L5 region on the lumbar lordosis; from the frontal plane, spinal curvature is also present in the lumbar-thoracic region. Percussion of the acantha and from the axial load on the spine does not cause pain. A fistula is present on the left iliac wing; the fistula is secreting pus; the edges around the mouth of the fistula mouth are pale, granulations are withered.

Per the methods of the Central Moscow Institute for Osteoarticular Tuberculosis, a cytological analysis of a smear and pus sample from the fistulous tract has been conducted. Present among the red blood cells in the cytological specimen are a large quantity of neutrophilic leukocytes in a state of karyolysis, and, in a lesser quantity, epithelioid cells, blast cells, and macrophages, characteristic of the tuberculous process.

The heart tones are muffled, with a systolic murmur at the apex, and there is vesicular breathing in the lungs. Pulse – 74 beats per minute; BP = 120/70 mm Hg. Blood and urine analysis from 08/05/62 – no deviation from the norm. X-rays of the chest cavity from 11/05/62 – show no visible changes. ECG from 08/05/62 – sinus tachycardia, prolongation of ventricular systole. Radiographs of the spine show degradation of the IV-V lumbar bodies and of the first sacral vertebra. The bodies of the first two vertebrae are almost completely degraded, the promontory is absent. At this level, the spine is bent at an angle of 160°. The first sacral vertebra has converged with the body of the third lumbar vertebra. In the front of the spine, blotches from the fistulography

can be seen; small patches of contrasting masses are situated in the destroyed bodies of the lumbar vertebrae.

DIAGNOSIS: focal tuberculosis of the spine L4–5, S1 intervertebral cavity, fistula form, kyphosis 160°.

Due to the maturity of the fistulous process, the presence of an intervertebral cavity, its proximity to the spinal canal, and the risk of abrasion at the site in the abdominal cavity, posterior *ad oculos* elimination of the cavity is prescribed. Removal of the most degraded 4th lumbar vertebra is planned, and, given good visibility of the spinal cord, location and eradication of the tubercle fistula, as well as the straightening of the curved spine in the postoperative period.

20/06/1962. under ether anesthesia oxygen mask, an operation is conducted to remove lumbar vertebrae IV and intervertebral excochleation cavity. Skeletonization of the acantha and arches III, IV and V of the lumbar vertebrae has occurred in the gibbus, transverse processes of the IV lumbar vertebra are articulated. Next, its acantha, articular processes and arches are excised. The vertebral canal is opened, the epidural is exposed, the spinal canal side walls and the transverse processes of the vertebrae are excised.

A gauze strip was laid under the spinal cord (cauda equina), which is slightly offset to one side and the remnants of the carried vertebral body were removed by morcellation with Luer forceps. The back of the destroyed 4th vertebral body was thin, its removal exposed the cavern, containing pus and caseous masses. The cavity was lined with granulations, which were scraped and removed along with the contents of the cavity. Vertebrae were located above and below – cavity walls were carefully scraped. Bleeding was stopped with tamponage, 1.0 streptomycin was applied to the wound. The layered blind suture of the wound. During surgery, 250.0 matching blood type was transfused, antishock, a 5% glucose solution and normal saline were applied.

Following the operation, the patient was placed on her stomach. For the first three days,

⁷ Excerpt from the second volume of M.S. Makarov’s doctoral dissertation “Combination Treatment of Kyphosis from long term Tuberculous Spondylitis” [10].

her condition was critical, with a pulse of 150-120 bpm., blood pressure – 80–50–90 / 70 mm Hg; temperature 38, 9° – 38°; day 4 – low-grade fever recorded, thereafter – normal. Sutures were removed on the 10th day. Primary healing.

A histological examination of scrapings from the porous cavity showed tuberculous inflammation. A month after the operation the fistula closed. Passive spine reclamation therapy was initiated after 2 weeks by means of a wedge-shaped stand, placed under the chest. After one week, the patient was rolled onto her back, and a 7–8 cm-high cushion placed under the gibbus. Simultaneously, active spine reclamation therapy was initiated. Correction of the spine lasted for 2 months, after which the patient spent 4.54 and a half months in the osteo-tuberculosis sanatorium in Novo-Pyatigorsk. After reclination, the control x-ray photo of the patient's profile, showed an angle of 180° between the upper and lower knee, and spine at the site of the vertebrectomy. 12/01/63. Under ether anesthesia – an operation of posterior spine fusion per Henle-Whiteman was conducted. The postoperative period passed smoothly. The sutures were removed on the 11th day, healing by first intention. The patient was turned onto her back and laid on a loop-belt attached to Balkan frames and raised above the bed by 6 cm. The patient remained in this position for 4 months. X-rays of the spine taken on 16.05.63 demonstrated: a condition of L₄ following vertebrectomy and an osteoplastic fixation of the spine per Henle-Whiteman, a frontal block at the site of the vertebrectomy; a lateral radiograph showed interjacent trabecula of bone between the grafts and the bed. The patient,

wearing a brace, was allowed to walk. A month later, the patient was discharged. During the patient's hospitalization, antibacterial, restorative treatment was administered. Treatment with Streptomycin – 160.0, Phthivazidum – 275.0, Pask – 1530.0.

In early 1965, the patient began to complain about fever and the occurrence of pain on the left side of the abdomen. Examination revealed a prevertebral abscess, which had burst in the absence of a focal point in the spine. Further observation confirmed the recurrent nature of the infection of the opened abscess, since the patient soon recovered and for the entire year from 1965–1966 felt well.

Laboratory blood and urine tests in 1962 and in September 1966, were comparatively similar and fell within a normal range. As for the X-ray results of the spine, these showed a clear delineation of improvements occurring 4 years after surgery.

Four vertebrae can be seen on X-ray photographs of the lumbar spine following the vertebrectomy. The third and fifth lumbar and first sacral vertebrae appear as a single solid bone mass with compacted bone tissue without dilution and degradation. Good engraftment of autografts was observable on the back surface of the lumbar spine, as well as rear block formation. The angle of the spine at the surgical site was 180°.

Thus, the result of combination treatment should be assessed as good – the tubercular process was eliminated, the degree of deformation was significantly reduced and kyphosis in the lumbar at an angle of 180° was changing minimally. As of September 1966, D-ykh V. feels well, walks often, and attends college.