# SARATOV REGIONAL STATE ORTHOPEDIC WORKSHOP AS A FACILITY OF GROWING PROSTHETIC INDUSTRY IN THE EARLY YEARS OF THE SOVIET STATE

Grishin S.E., Ulyanov V.Yu., Fedonnikov A.S.

*Saratov State Medical University n.a. V.I. Razumovsky, Saratov, Russia*

We outlined the early history of Saratov Regional State Orthopedic Workshop. Its role in the 1920s was unique since it led to establishing a medical and technical basis for further development and quick introduction of orthopedic innovations due to the interaction of medical science, advanced practice, and production. All these resulted in providing comprehensive and complex aid to the patients with musculoskeletal diseases. The procedures and system of state social politics for maimed defenders of the country were inefficient back then and provided no decent living conditions for disabled war veterans. The prosthetic rehabilitation as a special area of medical care and engineering is of special significance in terms of state economics, but it was underdeveloped in the studied time and totally dependent on the human potential as it was exemplified by Saratov Regional State Orthopedic Workshop. Regional state orthopedic workshops were the points of growth for the prosthetic industry of the country. All the archive documents are new to be introduced into the scholarly discourse.

**Keywords**: orthopedics history, prosthetic industry, regional state orthopedic workshop, Sergey Mirotvortsev, Leonid Deryabin

After World War I, the number of people with disabilities in Europe increased by almost 10 times and amounted to 18.4 million persons [1, 2]. According to P.P. Shcherbinin, in 14 months of the war (December, 1915 to January, 1917), the number of maimed individuals was 60 thousand, and the total number of the disabled war veterans in Russia at the beginning of 1916 was 800 thousand people [3]. The Civil War in Russia resulted in the significant number of people in need of orthopedic aid.

The need for resocialization of the disabled veterans contributed to the emergence of social support in various forms, pensions and allowances being the most significant of them. In the same period of time, public associations that protect the rights of these citizens began to form. The unions of maimed worriers brought the issue of expanding their social securities to the agenda, in particular the treatment, rehabilitation and support of the disabled.

The mass disability of working-age people provided an impetus for the development of prosthetics and designing technical means for rehabilitation and care. However, the prosthetic and orthopedic industry has been poorly studied with the exception of a few published researches [4].

The objective of this study is to investigate the unexplored stages of the orthopedic industry institutionalization during the Soviet state formation exemplified by the regional prosthetic workshop setup.

**Material and methods**

The source database for this study was formed by the unpublished documents from the Saratov Region State Archive and Saratov Research Institute of Traumatology and Orthopedics funds as well as the published documents. The methods of data acquisition were the comprehensive analysis of the documents in state and departmental archives as well as other literature sources. The main method of describing the findings was the analysis. Most archival materials are introduced into scientific discourse for the first time. The chronological framework of this research is 1916-1930.

**Results**

During World War I, the 139$^{th}$ Evacuation Hospital for prisoned soldiers and officers was located in Saratov. The rector of the Imperial Nikolaev University V.I. Razumovsky and Professor S.I. Spasokukotsky were the consultants in that hospital. Observing the increase in the number of disabled people, the University professors came up with the initiative to setup a prosthetic workshop for the hospital [5]. This initiative was supported by the public, and in 1916 the orthopedic workshop was founded to help the disabled in Saratov. They made prostheses for upper and lower extremities, leather braces, fixing devices, orthopedic shoes, bandages and other items of orthopedic aid. The workshop was arranged by the Committee of Saratov Provincial Union of Crippled Warriors, and provided free prostheses and other orthopedic items to war invalids.

In 1916-1918, the workshop came under the jurisdiction of the All-Russian County Union, and they made prostheses for a small number of war invalids. In 1918, the prosthetic trade was transferred to the People's Commissariat for Social Welfare. Provincial departments of social welfare began founding workshops to make and repair prostheses [6]. All existing workshops of the County Union were also transferred to the social welfare authorities. Saratov workshop began to supply prostheses and other orthopedic items to a larger number of the Red Army soldiers and disabled workers free of charge.

Another reorganization that started on April 1, 1920 led to transferring of all orthopedic prosthetics trade in the USSR from the People's Commissariat of Social Welfare to the People's Commissariat of Healthcare, and its employees conducted an audit of prosthetic workshops. It was found that many workshops did not have the necessary technologies or qualified staff, and thus the decision was made to found the support centers for providing the citizens with prostheses and orthopedic items; these centers gained the status of state district workshops. Saratov Prosthetic Workshop upgraded its status to a state district workshop, it was given a government assignment and therefore the funding to manufacture prostheses for 12 USSR regions: 8 provinces (Saratov, Penza, Tambov, Astrakhan, Aktobe, Bukeev, Kustanai, and Orenburg), 3 regions (Akmolinsk, Semipalatinsk, Ural) as well as the Republic of the Volga Germans [7]. The order of the People's Healthcare Commissar N.A. Semashko appointed Saratov University Professor of S.R. Mirotvortsev as a part-time workshop director [8].

The appointment of Professor S.R. Mirotvortsev to this position was justified by his professional expertise and good knowledge of both medical and technical orthopedic challenges. When another person was chosen for the permanent position of the director, S.R. Mirotvortsev remained to be the chairman of the Prosthetic Workshop Medical and Technical Board. The board function was to define if the treatment was complete or any aftercare needed related to prosthetics [9]. Saratov Regional State Prosthetic Workshop of the People's Commissariat of Healthcare was situated in the center of trade establishments at the corner of Aleksandrovskaya and Tsyganskaya streets. The main purpose of prosthetics was to restore the ability of the maimed person to work, return them to the state, society, and families. No less than 500 orthopedic units were produced in the workshop annually. The workshop had 4 general workers, 1 doctor, 7 locksmiths, 5 harness makers, 1 carpenter, 2 shoemakers and other craftsmen, 23 persons in total[1].

The prosthetic workshop produced a wide range of orthopedic items (Table 1) for the rehabilitation of patients with various diseases. Artificial legs, crutches and similar items accounted for 59.2% of the total number of the produce. There were also items meant for the treatment of joint and spine diseases (bandages, braces, etc.), foot pathologies (orthopedic insoles, shoes, etc.), and much more.

The prevalence of lower limb prostheses is logically explained by their purpose of the replacement of the lost limb supporting function; this significantly compensated for the loss of the ability to work. The effect of the upper limbs prostheses was mostly ‘cosmetic’.

[1]The Archive of Saratov State Medical University n.a. V.I. Razumovsky. List 1, file 1894, sheet 1-354.

At first sight, the number of braces (14) seems to be not so high, but if we consider their manufacturing method we'll see the amount and complexity of work as significant for the twenties of the last century. The manufacturing started with a plaster cast of the patient's torso and suggested the individual design of leather elements and fitting of metal parts.

Since prostheses and braces were custom-made for each patient, the qualifications of an orthopedist were of great importance for more accurate adaptation of an orthopedic item to the individual features of a disabled person or a patient. As one can see in Table 1, most prostheses were meant to be worn permanently as they were made for the disabled people who irretrievably lost the function or shape of their limbs. The number of prevention and rehabilitation orthopedic items within the total amount of the workshop produce did not exceed 20%.

**Table 1.** Types and numbers of the items made in Saratov Prosthetic Workshop in 1926 (the calculation is made by the authors based on the data of Saratov Region State Archive[2])

| | |
|---|---|
| Artificial leg | 189 |
| Artificial arm | 6 |
| Hand | 3 |
| Lower leg with metal cup | 3 |
| Half-brace | 4 |
| Leather brace | 14 |
| Fixed apparatus for the lower extremity | 10 |
| Fixed apparatus to the knee | 12 |
| Hernia bandage | 23 |
| Plaster bed | 1 |
| Crutches with no tips | 135 |
| Orthopedic shoes | 50 |
| Knee liner | 42 |
| Repairs | 63 |
| Other orthopedic items | 52 |

All prostheses were made with the 1918 templates in Saratov Orthopedic Workshop until July, 1925. These prostheses didn't look nice and often were of poor quality. The main objective of the workshop staff was to improve the quality of service. With this aim in mind, Professor S.R. Mirotvortsev invited the member of the Medical and Technical Board L.V. Deryabin to join the workshop staff.

Leonid V. Deryabin was the successor of the leading European orthopedic schools in Saratov. He was among the first orthopedic practitioners in the Russian province who applied the

[2] Saratov Region State Archive. Collection P-461, list 2, file 50, sheet 118-118 reverse.

latest achievements of European orthopedics. As a student at Odessa University, he mastered the best practices of Odessa and Kharkov orthopedic scientific schools. After graduating from the university, Leonid Deryabin studied with the best European orthopedists of the beginning of the 20th century. Viennese professor Adolf Lorenz [10] shared with Deryabin his knowledge on treating osteoarticular tuberculosis and congenital dislocations of the joints. In Zurich he studied the treatment of scoliosis and muscle transplantations with Professor Wilhelm Schulthess. In the Rickets Institute of Milan headed by Riccardo Galeazzi, the founder and editor of Orthopedic Archive journal, he learnt about pediatric preventive orthopedics. In Breslau (now called Wroclaw) Hermann Kuttner and Erwin Payr known for his arthroplasty works taught Deryabin free plastic surgeries of the joints. From 1912 until the end of his life (1944) L.V. Deryabin worked in Saratov. In 1914 he founded his own clinic with its official name *Dr. Deryabin's Orthopedic Clinic*[3]; it soon became one of Saratov orthopedic centers and was operating until the liquidation of private clinics in the USSR[4].

When all private clinics in the USSR were shutdown, Deryabin took the job in the oldest Saratov Aleksandrovskaya hospital (renamed Vtoraya Sovetskaya after the Bolsheviks came to power). From 1920 to the end of the 1930s he simultaneously worked as a supernumerary assistant at the department headed by S.R. Mirotvortsev [11] who personally invited him for the position, dealt with the problem of traumatism, and also worked at Professor S.R. Mirotvortsev's faculty surgical clinic.

As the workshop director put it in his report, '*the quality has significantly improved since an orthopedic doctor Deryabin <…> was admitted to the staff thanks to the authority given to the orthopedic doctor*'[5]. Since L.V. Deryabin started his work in the workshop, they began to make their orthopedic items taking static and dynamic features of the disabled into account which affected the level of patients' physical activity and quality of their lives.

Fig. 1 shows a corset for left-sided scoliosis designed by L.V. Deryabin and presented at Moscow Exhibition of Medical Equipment. The leather-metal corset was designed for the conservative treatment of kyphoscoliosis. It featured a special 'support plate' that prevented the progression of 'rib hump' [12]. This and other inventions suggest that L.V. Deryabin was a favorer of the conservative treatment methods in orthopedics that dominated in the first half of the 20th century.

[3] Saratov Region State Archive. Collection 79, list 1, case 1391.
[4] We could not find the date of Dr. Deryabin's Clinic shutdown.
[5] Saratov Region State Archive. Collection P-461, list 2, case 50, sheet 119.

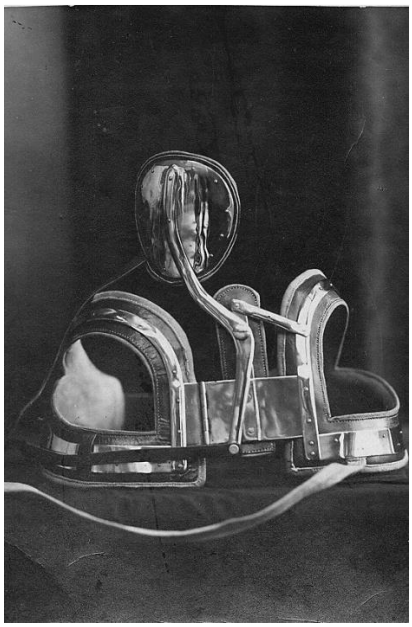

Figure 1. A brace for left-sided scoliosis designed by L.V. Deryabin exhibited at Moscow Exhibition of Medical Equipment[6]

Each Russian region had its state orthopedic workshop, and private prosthetic orthopedic institutions were also allowed. Saratov Regional State Prosthetic Workshop focused on the most complex types of orthopedic aid. For instance, Tambov Provincial Health Department in their letter No. 107 of January 7, 1925 to Saratov Provincial Healthcare Department stated that disabled people were sent to Saratov exclusively to be given complex prostheses (those Tambov Workshop could not make) designed and made for them[7].

In the 1920s Saratov Prostheses Workshop was a unique enterprise, compact and quite efficient even though the industry resources were scarce. It enabled designing and fast introduction of orthopedic innovations due to the interaction with medical science, best practices and manufacturing. This resulted in providing comprehensive care to patients with various musculoskeletal pathologies.

**Discussion**

The form of workshops and technologies of the time for manufacturing orthopedic items were not enough to solve the problem of providing for all those in need. The prostheses were made with softwood[8] that featured the lightness of the structure and insensitivity to heat and cold

[6] Saratov Region State Archive. Collection P-338, list 1, case 333, sheet 14.
[7] Similar braces were widely used till the 1990s, this type was known as «Leningrad brace». Since the introduction of modern surgical methods, the relevance of those had significantly decreased.
[8] Saratov Region State Archive. Photoarchive. Collection ЩЬ, storage items 14608, 14609 (published for the first time).

but its major drawback was the fragility of the designs causing new problems of prostheses availability. For example, on August 1, 1926 the state register included a significant number of disabled people in need of prosthetic and orthopedic items: 1969 of them were from Saratov Province, 420 from Penza Province, 1352 from Tambov Province, 65 from the Autonomous Soviet Republic of Volga Germans, and 8 from the Kalmyk Autonomous Region. Separate records were kept for Ryazan-Ural Railway with 161 individuals in need on the list, and for water transport companies with 34 individuals in need of prosthetic and orthopedic items. According to expert estimates, the total number of disabled people in these territories, including those not registered, was at least 8.000 individuals[9]. While every disabled person had the right to be given a free prosthesis after 2 years of waiting and there was a financial provision of the assignment for free prostheses for 400 persons, every disabled person could actually receive just one free prosthesis in 20 years.

Trying to somehow solve the problem of providing disabled individuals with orthopedic items, the People's Commissariat for Healthcare by its order No. 259 of October 7, 1922, established the procedure for the appointment and distribution of free prostheses, devices and shoes. The order also established the priorities for receiving orthopedic aid. The first priority was given to qualified workers who would be able to go back to their old jobs or take new ones when given prostheses or orthopedic items. The second priority was given to the disabled individuals of high and average qualifications who would be forced to take a job of lower qualification after the prosthetic aid. The third priority included all other disabled and maimed.

Highly qualified workers, senior officials with outstanding revolutionary credentials or science and technology achievements, revolutionary activists, qualified experts as well as those patients who needed specific orthopedic aid due to their medical condition were of top priority to be given their prostheses. However, this priority division of disabled people solved no problems and caused excessive social tension.

There were several options for solving this problem. The first one was the arranging special medical institutions to provide orthopedic aid. L.V. Deryabin raised the question of founding an orthopedic clinic. His justified opinion was included into the report of the head of Saratov Regional State Prosthetic Workshop to Saratov City Council on August 12, 1926[10]. However, in the USSR this path was taken only after WWII, when the number of disabled individuals significantly rose in all regional centers, and the traumatology and orthopedic

[9] Saratov Region State Archive. File P-461, list 2, case 50, sheet 117-119 reverse.
[10] Saratov Region State Archive. File P-461, list 2, case 50, sheet 12.

hospitals for war veterans were set up. Some regions had the traumatology and orthopedics research institutes operating. It is important to note that the State Institute of Reconstructive Surgery and Orthopedics, established in Saratov in 1945, was headed by Professor S.R. Mirotvortsev.

Another option for improving prosthetic and orthopedic aid was the transition from workshops and handicraft production with the quality of manufactured items being completely depended on the workers' skills to an industrial form. The General Prosthetic Directorate was founded only in October, 1937. Indeed, this decision contributed to the expansion of produce and increasing the range of orthopedic items [13]. The first prosthetic factories were set up at the regional state workshops, however it was only after WWII that the production of prostheses and orthopedic items was made a branch of the national industry.

**Conclusion**

Summing up, of time it should be noted that in the studied period the mechanism and system of the state social policy in relation to the maimed war invalids were far from being perfect, lagged behind and did not always provide decent living conditions for war invalids. Prosthetics, as a special area of medicine and technology conjugation has always been of great importance for the state and its economy, however it was poorly developed and completely depended on the quality of expert skills. In Saratov State Prosthetic Workshop a successful combination of academic science and innovative thought took place. The same thing, but on a global scale, and with an emphasis on 'for the first time', happened several decades later in Kurgan [14, 15]. State regional prosthetic workshops served as growth points for the formation of the country's prosthetic industry in the first decades of the Soviet state.

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**Authors**

**Sergei E. Grishin** – DSc, Professor, Expert in the Dept. of Scientific and Technical Information, Scientific Research Institute of Traumatology, Orthopedics and Neurosurgery, Saratov State Medical University n.a. V.I. Razumovsky, the Russian Federation Ministry of Healthcare, Saratov, Russia. ORCID 0000-0002-0990-4175

**Vladimir Yu. Ulyanov** – MD, DSc, Associate Professor, Director for Science and Innovations, Scientific Research Institute of Traumatology, Orthopedics and Neurosurgery, Saratov State Medical University n.a. V.I. Razumovsky, the Russian Federation Ministry of Healthcare, Saratov, Russia. ORCID 0000-0002-9466-8348

**Aleksandr S. Fedonnikov** – MD, DSc, Associate Professor, Vice-Chancellor for Science and Research, Saratov State Medical University n.a. V.I. Razumovsky, the Russian Federation Ministry of Healthcare, Saratov, Russia. ORCID: 0000-0003-0344-4419

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