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PHENOMENON OF DEMIKHOV.
In the Sklifosovsky Institute (1960-1986).
V.P. Demikhov's *Experimental Transplantation of Vital Organs* is pacing about the planet (1962)

S.P. Glyantsev

A.N. Bakoulev National Medical Research Center for Cardiovascular Surgery,

135 Roublyevskoe Hwy., Moscow 121552 Russia;

N.A. Semashko National Research Institute of Public Health

12 Bldg. 1 Vorontsovo Pole St., Moscow 105064 Russia

Correspondence to: Sergey P. Glyantsev, Prof., Dr. Med. Sci., Head of the Department of the History of Cardiovascular Surgery at A.N. Bakoulev National Medical Research Center for Cardiovascular Surgery, Head of the Medical History Unit within the Medical History Department at N.A. Semashko National Research Institute of Public Health,

e-mail: spglyantsev@mail.ru

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The article describes and analyzes the circumstances related to the translation of V.P. Demikhov's book Experimental Transplantation of Vital Organs *into English by Basil Haigh in 1962, its publication in the USA and an ambiguous response of foreign readers and surgeons to it. At that time, V.P. Demikhov continued actively preparing for human heart transplantation and declared that in the foreign press. He was granted a gratitude and a cash prize for completed research for the year of 1962 in the Sklifosovsky Research Institute for Emergency Medicine. The results of the preparatory work were summarized. The fact of V.P. Demikhov's readiness to perform heart transplantation on clinic was stated, including that one to*

harvesting and revitalizing a cadaveric organ, but there were no permission to transplant it to a human.

Keywords: history of transplantation, V.P. Demikhov, Experimental Transplantation of Vital Organs, V.P. Demikhov, human heart transplantation

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In the previous article, it was not by chance that we put the book by V.P. Demikhov "Experimental transplantation of vital organs" in one row with the largest discoveries in the field of transplantation in the early 1960s. First, it was really the first fundamental monograph on experimental heart and lung transplantation in warm-blooded animals, still widely cited in the world medical press [1], and second, shortly after its publication in Russian, Dr Basil Haigh, the famous English doctor and the medical literature translator, from the University of Cambridge began working on its translation into English (Fig. 1).

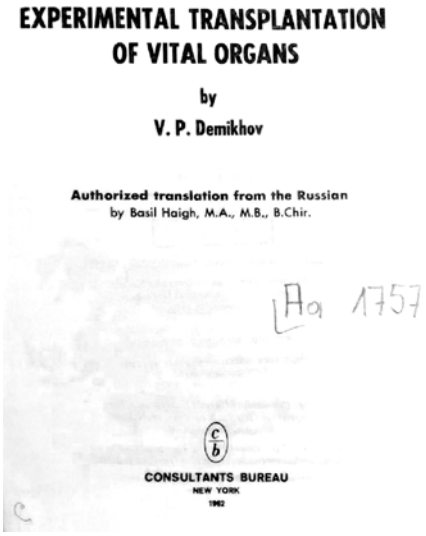
Fig. 1. Basil Haigh (1919–2005), the translator of V.P. Demikhov's book *Experimental Transplantation of Vital Organs* into English (1962) [www.ncbi.nlm.gov/pmc/articles/PMC1326986/bin/bmj_332_7533_123]

A graduate of Cambridge, Bachelor of Medicine and Surgery, Master of Arts, B. Haigh fought against fascism in the Medical Corps. of the Royal Armed Forces of Great Britain in the years of the 2nd World War; and in 1950, he was appointed the 1st Secretary and a part-time Doctor of the Embassy of Great Britain in the USSR where he began to learn Russian. Returning to his Motherland in 1953, he started working as a doctor in one of non-medical ministries and was dealing with translating articles from Russian scientific medical journals for the Plenum Press Publishing[1], British Library, Ministry of Agriculture, Fisheries and Nutrition, as well as for private organizations.

[1] Plenum Press Publishing. In particular, this Publisher translates and publishes the "Bulletin of Experimental Biology and Medicine" journal in the USA and other English-speaking countries.

In 1959б B.Haigh went to work at the University of Cambridge Linguistic Institute and focused entirely on translation activities [2]. We do not know how it happened that V.P. Demikhov's book came to B. Haigh, but at the end of 1962, it was published in New York (USA) as translated by B. Haigh under the title "Experimental Transplantation of Vital Organs" [3] (Fig. 2, 3). Moreover, the translation was *authorized*, which meant that it had been reviewed and approved by V.P. Demikhov. In December 1962, the British journal "The Journal of the Royal Society for the Promotion of Health" announced the book with the following words:

> "This is a remarkable book. In future years experiments on the transplantation of vital organs in animals may lead to the successful clinical application of organ grafting in the treatment of human patients with consequent prolongation of life. For many years, V.P. Demikhov has tried to solve this complex problem. <...> Unfortunately, ... the experimental transplantation of vital organs is at present only temporarily effective. After the initial taking and functioning of the graft, as a rule, the transplanted organ and the recipient die within a short time, the main cause being the biological incompatibility of the tissues. Demikhov has transplanted lungs, hearts, kidneys and other organs in experimental animals. He believes that the causes of failure, eventually, can be overcome and gives his reasons ... "[4].


EXPERIMENTAL TRANSPLANTATION
OF VITAL ORGANS

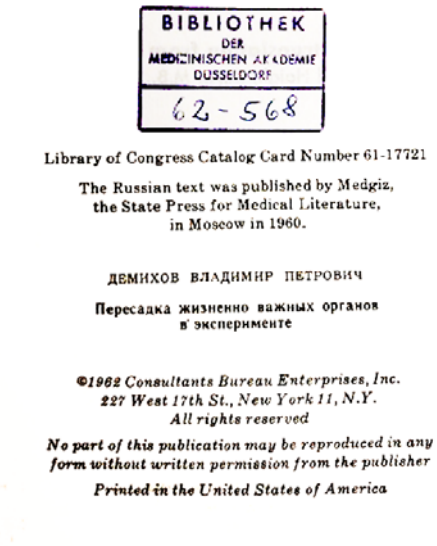
by

V. P. Demikhov

Authorized translation from the Russian
by Basil Haigh, M.A., M.B., B.Chir.

CONSULTANTS BUREAU
NEW YORK
1962

Fig. 2. Demikhov V.P. Experimental Transplantation of Vital Organs. New York: Consultants Bureau, 1962. Cover


BIBLIOTHEK
DER
MEDIZINISCHEN AKADEMIE
DÜSSELDORF
62-568

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The Russian text was published by Medgiz,
the State Press for Medical Literature,
in Moscow in 1960.

ДЕМИХОВ ВЛАДИМИР ПЕТРОВИЧ

Пересадка жизненно важных органов
в эксперименте

Printed in the United States of America

Fig. 3. Demikhov V.P. Experimental Transplantation of Vital Organs. New York: Consultants Bureau, 1962. Publisher's imprint

At the same time, the annotation to the monograph was published in "The British Medical Journal":

"... The author clearly possesses not only remarkable surgical skill but great ingenuity in solving difficult technical problems, and his account of

experimental transplantation of the heart and lungs, the kidney, the bead, and even of half of the body is fascinating. So too is the discussion on the replacement of the heart by mechanical pumps and the surgical treatment of coronary occlusion.

Demikhov's suggestion that it should be possible to obtain human organs for transplantation by temporarily re-establishing circulation and respiration in cadavers at a time after death when restoration of cerebral function is no longer possible also merits serious consideration, though it clearly raises difficult ethical problems.

On the other hand the discussion of the biological − and in particular of the immunological − problems of transplantation is inadequate to say the least, and at times quite misleading. The publishers of the present translation were aware of this defect but decided that the work should nevertheless be made accessible to English readers. Their decision is to be welcomed, but it is important that those who read the book should take the trouble to acquire from other sources some insight into the immunogenetics of transplantation unless they possess this already" [5].

So, very carefully and tactfully, V.P. Demikhov was hinted that his immunological views, to put it mildly, did not correspond to the commonly accepted ones at that time, though his skills were qualified as remarkable, and the experiments fantastic.

In 1963, the "The Anesthesiologist" journal commented on the book, although not noticing its "anesthesiological peculiarities":

"This monograph dealing with transplantation experiences contains seven interesting chapters. It deals with overall problems of transplantation of tissues and organs, including altered physiology and circulation following such procedures. A survey of the literature on transplantation of tissues and organs is presented to bring the reader up-to-date as to the status of work on this problem.

The book is written in a style that makes for easy reading, and the reviewer gets the impression that the material is entirely factual. Techniques of heart and lung transplantation, as well as transplantation of the extremities, are presented[2]. Various methods employed in the transplantation of these organs are described and discussed. Both immunological and physiological alterations are described in detail. Methods of value in the transplantation of these organs, such as the use of artificial circulation, cross circulation, etc., are presented. A very adequate bibliography of both Russian and non-Russian literature is included. The 74 illustrations are of good quality and adequately supplement the text.

This monograph would be of interest and value to anyone engaged in investigative work in this field" [6].

From these brief annotations it is clear that their authors read the book very carefully, revealed its strengths and weaknesses, and captured and conveyed its essence absolutely correctly. After all, V.P. Demikhov's main strive was other than proving the feasibility of transplanting homoorgans in animals and, moreover, he was not aimed at self-promotion. His work was aimed at starting transplantation of the heart, lungs, and other organs in humans in the clinic as soon as possible, prompting surgeons to do that! And the second, in the absence of not only immunosuppressants, but also the very concept of pharmacological immunosuppression, he did his best to develop a technique for overcoming tissue (organ) incompatibility by using biological methods, specifically, cross circulation. And what was the assessment of this book by those for whom it was intended, that is, by surgeons?

[2] The last statement is not clear, since V.P. Demikhov was not dealing with limb transplantation, and no such operations were described in his book. Most likely, the author of the publication was familiar with the A.G. Lapchinsky's experiments of limb transplantation in dogs and confused one surgeon with another.

Here is the V.P. Demikhov's book assessment written in 1992 by H. Shumacker, a well-known American heart surgeon and a cardiac surgery historian from Indiana University in Indianapolis:

> "One of the greatest surgical monographs, it includes colored illustrations of twenty-four different techniques for transplanting the heart as an auxiliary or second heart and details operative and postoperative events and autopsy findings in two dozen of the 250 experiments with transplantation of an additional heart. It contains similar records of a number of experiments with cardiac and heart-lung replacement as well. In addition, there are briefer summaries of numerous other experiments.
>
> Demikhov was familiar with the relevant reported work on vascular suture techniques, transplantation of organs, and immunological aspects of the problem <...>
>
> Demikhov's work was first mentioned in North America, as far as is known, when Ralph Deterling told of a visit to him and spoke of his claim that one dog had lived for thirty-two days[3]. It was in this year, as mentioned, that the English translation of Demikhov's book was published and his work became generally available. It is interesting that prior to this time, a number of innovative investigators had conceived some of the same ingenious techniques that Demikhov had found useful in his studies" [7].

The last phrase is just remarkable in that it reflects the response of American surgeons to the English translation of V.P. Demikhov's book. From their response it follows that, first, the book received wide publicity, and V.P. Demikhov was talked about; and second, having been issued, the

[3] R. Deterling with a group of American surgeons, including M. DeBakey and C. Barnard among others, visited V.P. Demikhov during the XVII All-Union Congress of Surgeons in May 1960. Truly to say, as we have shown above, the guests saw no organ transplantation surgery, V.P. Demikhov only told them about his work and showed the dog with two hearts.

book debunked the priorities of many American surgeons in the field of experimental organ transplantation and cardiac surgery.

Here is an example. In May 2008, Dr F.Robicšek, a well-known American heart surgeon of Hungarian origin, one of the pioneers of cavopulmonary anastomosis, visited the Museum of Cardiovascular Surgery of Cardio-Vascular Research Center named after A.N. Bakulev. Having seen V.P. Demikhov's book "Experimental Transplantation of Vital Organs" in Russian, he asked us to get it and open it on the page where heart and lung transplantation experiments were described. "Read, please, when Demikhov performed the first operation", asked F.Robicšek. And when we translated this text fragment to him, he stated: "Unfortunately, I did it a couple of months later!"

But there were other reviews that contained negative assessments of V.P. Demikhov's work. Here is one of them, published in 1965 in the American Medical Association Journal "Archives of Internal Medicine". We give it without cuts:

> This volume represents a summation of the author’s considerable experience in transplantation of organs in laboratory animals. If the book offers no more than that, it does perform the service, *if for a limited group of readers, of presenting in English translation the details of varied surgical techniques which might otherwise be less publicized outside Russia* (hereinafter our italics - S.G.). Beyond that, the book has relatively little to offer.
>
> A short survey of the literature on transplantation of tissues and organs is given in the opening chapter. The next two chapters, comprising the major portion of the book, outline details of surgical procedures for transplantation of particular organs or groups of organs. Even after becoming accustomed to

bearing of such dramatic procedures as transplanting chimpanzee kidneys to humans, one cannot be but slightly startled by the chapter subheadings which proceed from "Transplantation of the Kidney" to "Transplantation of the Head" to "Transplantation of Halves of the Body."

It may be granted that there is a need for 'bold experimentation and increased experience in transplantation technique, nevertheless, the author's zeal for overcoming technical problems has overshadowed reasonable requirements of procedures related to foreseeable practical application. In describing the reactions of a dog's head transplanted to the neck of a recipient dog, the author illustrates its viability by stating, "If a finger was carefully extended towards it, ... it would bite it maliciously." *Well, one would hardly expect the poor mutt to be pleased about it all*[4].

Only a short chapter is devoted to immunological aspects of transplantation problems. The chapter was written by Z.P.Rovnova and consists of an account of her limited studies of erythrocyte agglutinins during postoperative periods in dogs with organ transplants. *This token acknowledgement of the role of immune phenomena in the transplantation problem* reflects the author's apparent belief that other factors are of equal or greater importance in rejection of transplants. Despite the mass of evidence implicating immune reactions in rejection, the author feels that vascular thrombosis, denervation of tissue, and wound infection play major roles in the phenomenon.

The final chapter on circulatory physiology related to organ transplantation consists of lectures given by the author between 1951 and 1953. One would hope that the author had at least brought them up to date before including them in the volume published in 1960.

For the surgeon interested in some purely technical aspects of organ transplants and willing to spend $17.50 for this translation, the book may be worthwhile. But for anyone looking for a reasonably comprehensive

[4] In the original: "The transplanted head reacted vigorously to the environment ... with a careful offering, it licked a finger, at the moment of irritation, bit it with bitterness" (V.P. Demikhov Experimental Transplantation of Vital Organs. M.: Medgiz, 1960, p. 144).

scientific coverage of the subject suggested by the title, other sources should be sought. [8].

The annotation, rather annoying in style and frankly unfriendly, testifies that the author, as well as the staff member of Medgiz Publisher who wrote the Foreword to the Russian-language text of the book, considered it a purely technical guide, which gave little help to a practical surgeon; they could see neither the main goal of the book, which we wrote about above, nor those discoveries that V.P. Demikhov was the first in the world to make.

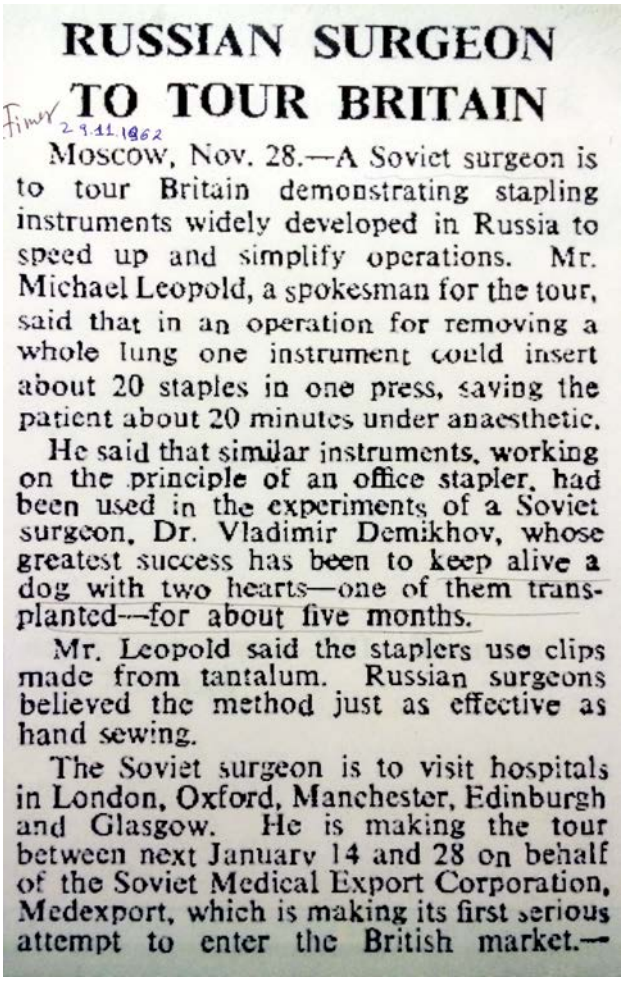
Nevertheless, the review simultaneously illustrated four remarkable facts. First, V.P. Demikhov's work was tracked abroad, at least since the early 1950s. Second, it was assessed far ambiguously. Third, the critical tone of the publication was obviously due to the fact that by 1965, transplantation had paced forward, far ahead of the book, and many of its items, especially the theoretical ones, were so outdated that it was really impossible to present them as the last word of science. But how then one should regard the 4th fact: in 1962 the book was sold at 12.5 dollars, and later, in 1965, its price increased to 17.5 dollars? After all, if the book is not in demand, then why should raise the price?

V.P. Demikhov gets prepared for human heart transplantation in clinic (end of 1962)

News of a dog named Grishka reached the shores of Albion. In its note, British "The Times" dated November 29, 1962 (we remind that Grishka died on the night of November 7-8) announced a planned scientific tour around the UK arranged by Medexport for a certain Soviet surgeon who would demonstrate a vascular stapling device to his British colleagues. Mr. M.

Leopold, the representative of the trip organizing company, told the newspaper's reporter about the striking capabilities of the Soviet stapling devices used when removing organs, mentioning that it had been used

"… in the experiments of a Soviet surgeon, Dr. Vladimir Demikhov, whose greatest success has been to keep alive a dog with two hearts – one of them transplanted – for about five months" [9] (Fig. 4) .



RUSSIAN SURGEON TO TOUR BRITAIN

Times 29.11.1962

Moscow, Nov. 28.—A Soviet surgeon is to tour Britain demonstrating stapling instruments widely developed in Russia to speed up and simplify operations. Mr. Michael Leopold, a spokesman for the tour, said that in an operation for removing a whole lung one instrument could insert about 20 staples in one press, saving the patient about 20 minutes under anaesthetic.

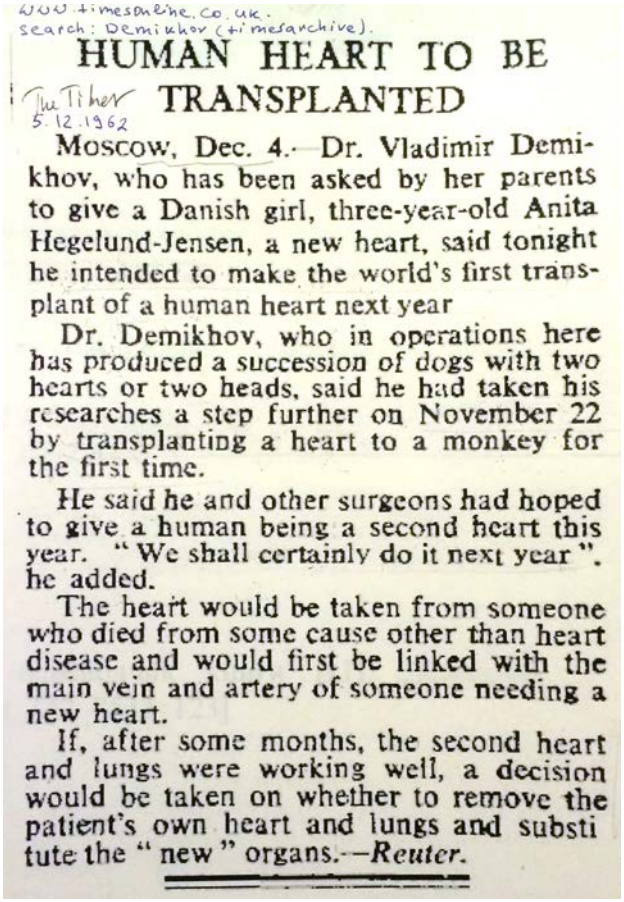
He said that similar instruments, working on the principle of an office stapler, had been used in the experiments of a Soviet surgeon, Dr. Vladimir Demikhov, whose greatest success has been to keep alive a dog with two hearts—one of them transplanted—for about five months.

Mr. Leopold said the staplers use clips made from tantalum. Russian surgeons believed the method just as effective as hand sewing.

The Soviet surgeon is to visit hospitals in London, Oxford, Manchester, Edinburgh and Glasgow. He is making the tour between next January 14 and 28 on behalf of the Soviet Medical Export Corporation, Medexport, which is making its first serious attempt to enter the British market.—

Fig. 4. A note from the newspaper *The Times* of November 29, 1962, covering V.P. Demikhov's achievements. Copy. From the collection of the Cardiovascular Surgery Museum at A.N. Bakoulev National Medical Research Center for Cardiovascular Surgery

Such an "advertisement" of a Soviet surgeon undoubtedly increased his worldwide fame many times. And as a result, the same newspaper dated December 2, 1962, reported stunning news: The parents of a 3-year-old girl Anita Hegelung-Jensen from Denmark asked Demikhov to give her a heart transplant! (Fig. 5).



www.timesonline.co.uk.
search: Demikhov (timesarchive).

HUMAN HEART TO BE TRANSPLANTED

The Times 5.12.1962

Moscow, Dec. 4.—Dr. Vladimir Demikhov, who has been asked by her parents to give a Danish girl, three-year-old Anita Hegelund-Jensen, a new heart, said tonight he intended to make the world's first transplant of a human heart next year

Dr. Demikhov, who in operations here has produced a succession of dogs with two hearts or two heads, said he had taken his researches a step further on November 22 by transplanting a heart to a monkey for the first time.

He said he and other surgeons had hoped to give a human being a second heart this year. "We shall certainly do it next year", he added.

The heart would be taken from someone who died from some cause other than heart disease and would first be linked with the main vein and artery of someone needing a new heart.

If, after some months, the second heart and lungs were working well, a decision would be taken on whether to remove the patient's own heart and lungs and substitute the "new" organs.—*Reuter.*

Fig. 5. Note from the newspaper *The Times* of December 5, 1962, about the appeal to V.P. Demikhov for making heart transplantation to 3-year-old girl. Copy. From the collection of the Cardiovascular Surgery Museum at A.N. Bakoulev National Medical Research Center for Cardiovascular Surgery

When it took place, what was V.P. Demikhov's reply to this request, and what happened to the girl - there was nothing about in the note. But the reporter for the Reuter Agency who had interviewed the Soviet surgeon on this occasion said that V.P. Demikhov planned *to* make the *world's* first human heart transplantation the following year and had already begun preparations for it, having performed a monkey heart transplant on November 22.

V.P. Demikhov also said that he and a group (?) of surgeons hoped that they would be able to transplant *an extra heart to a* human that year. "But we will definitely do it next year!" added V.P. Demikhov.

The reporter also wrote that the donor heart for the transplantation would be taken from a corpse of a human who had died from causes unrelated to heart disease, and the heart would initially be implanted onto the great vessels in the recipient's chest as an additional one. If the second heart and lungs would work satisfactorily for the following few months, the surgeons will remove the sick heart and lungs from the patient and replace them with the healthy ones [10].

The mention of a monkey is noteworthy. The following was written in Sheet of Research Topics No. 39 of the Organ Transplantation Laboratory for the year 1962:

> “In November 1962, the experiment on heart and lung transplantation to a monkey was performed for the first time. It was found that anesthesia, used in dogs, is applicable in monkeys. The heart-and-lung transplant surgery is well tolerated by apes. An agreement has been reached with the Director of the Institute of Experimental Pathology and Therapy of the USSR Academy of Medical Sciences (Sukhumi) about the continuation of joint experiments on transplantation of heart, lungs, limbs, and other organs in monkeys ” [11].

It follows that in 1962, transplantations were performed in more than one monkey, but in several, and also that those experiments were the last in the series of V.P.Demikhov's preparing to heart transplantation in humans.

The Sklifosovsky Institute Administration and, in particular, the Director M.M.Tarasov, supported V.P.Demikhov and his endeavours, which is proved by the following document:

"ORDER No. 192
Of the Moscow City Order of the Red Banner of Labor
Research Institute for Emergency Medicine named after
N.V.Sklifosovsky
dated August 19, 1962

In 1961–1962, the Institute has conducted wide research ... The results of the research performed in the Institute for the mentioned period have received a positive assessment from the Presidium of the Academic Council of the RSFSR Healthcare Ministry. Taking into consideration what was said and being guided by .., and also taking into account the Decision of N.V.Sklifosovsky Institute Scientific Council dated August 10, 1962 (Proceedings No.9)

I ORDER:

To give bonus cash amounts in the amount of the monthly salary ...: to:

21. V.P.Demikhov, the Head of the Organ Transplantation Laboratory for:

a) the implementation of the monograph "Experimental Transplantation of Vital Organs" published in the USSR and foreign countries,

b) the implementation of three studies on investigating the functions of the transplanted head that were published in the GDR[5],

c) the implementation of two studies on the transplantation of the heart, lungs, limbs, and sternum that were reported at the All-Union Conference on the Transplantation of Tissues and Organs[6],

d) conducting the research of the new technique of cardiac massage and heart revitalization that was reported at the All-Union Conference on Revitalization[7],

e) the implementation of the study on the surgical treatment of heart diseases that was reported at the Institute Session and the Session of the USSR Academy of Medical Sciences,

e) the development of a new method of heart and lung transplantation (temporary)[8],

g) the development of a new scheme for heart revitalization in ambulance-delivered corpses

in the amount of 240 rubles[9] ...

Signed by M.M.Tarasov, Director of the Sklifosovsky Institute"[12].

If V.P.Demikhov's achievements were evident, important, and worthy bonuses, then why were they not implemented in the clinic? And what sorts of "mythical" corpses delivered by ambulances for revitalization were mentioned, if they did not appear in the Annual Report at the end of the year? And now let us summarize the real results of what V.P.Demikhov had had to his credit by the end of 1962:

[5] This refers to the studies published in "Acta Biol. Med. Germanica" in 1960–1961.
[6] II All-Union Conference on the problems of tissue incompatibility and transplantation of organs and tissues (Odessa, 1961).
[7] II All-Union Conference on Pathology and Therapy of Terminal Conditions (Leningrad, 1961).
[8] Apparently, this is a method of transplanting the heart with a lung in dog Grishka.
[9] The amount of the monthly salary.

- All the main stages of the heart transplantation technique had been worked out on dogs (more than 250 experiments) and monkeys (two-three).
- The method of reviving dead hearts in dogs and humans had been developed and tested before moving to the Sklifosovsky Institute. Eight of 15 human hearts were revitalized.
- There was developed a concept of overcoming the biological incompatibility: 1) the donor selection considering the blood group, 2) the transfusion of donor fibrinolysis (cadaveric) blood to the recipient, 3) the cross-circulation technique.
- There were developed methods of immunological control (serological reactions).
- Most likely, there were antibiotics and anticoagulants.
- The concept of two-staged heart transplantation onto the great vessels into the chest or on the hip had been grounded; it precluded a failure, because in case of the donor organ death (rejection), V.P.Demikhov planned to remove it, while the recipient would remain with his native, albeit sick, heart.
- Cardiac resuscitation techniques had been developed: clamping of the aorta, the direct cardiac massage, mechanical lung ventilation, defibrillation with the current from a 220-volt electrical network.
- It was possible to connect both the donor and the recipient either to a cardiopulmonary bypass machine, or (so far theoretically) to a brain-dead revived body.
- There were (theoretically) surgeons and other doctors who could help to do it (most likely, it was P.I. Androsov).

- There was a passionate desire of V.P. Demikhov, a Soviet man, to be the first in the world to make a heart transplantation to a human and thereby glorify his Motherland, as did the first Soviet cosmonauts Yu.A. Gagarin, G.S. Titov, A.G. Nikolaev, and P.R.Popovich,
- Finally, there was the Order of the Healthcare Ministry issued on January 2, 1962, that allowed for the removal of organs from corpses (Fig. 6).

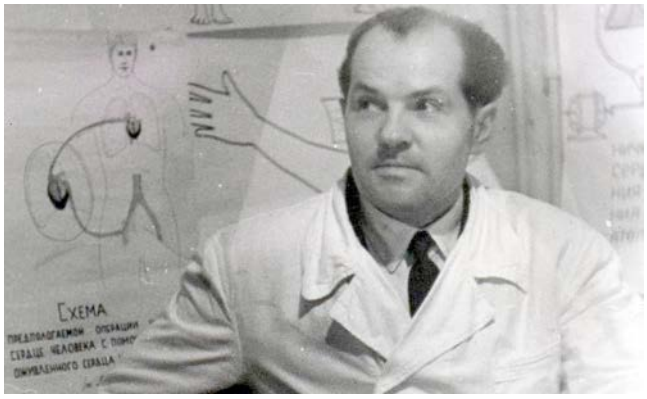


Fig. 6. V.P. Demikhov in his office in the Sklifosovsky Research Institute for Emergency Medicine. The scheme of proposed surgery “to engraft” a revived cadaveric heart to a human indicates his readiness for heart transplantation according to the following pattern: the recipient's upper vena cava − the right atrium of the donor heart − the left atrium of the donor heart − the recipient's femoral vein. Presumably 1962-1963

But V.P. Demikhov had not come through the main, final stage to complete the whole list. He did not have the permission to perform the surgery.

But who should have granted such permission? In terms of the "democratic centralism" of the Soviet system, the order-consent to perform

transplantation in a human had to come from the very top, from the Healthcare Minister. But the Minister could not give such an order without knowing well about the readiness of the medical institution. And who should have notified him of whether the hospital was ready for organ transplantation? Probably, its administration and the Scientific Council should have done it.

And who of the Sklifosovsky Institute Management could give such a notification? Only one person could: Professor B.A.Petrov, the Chief Surgeon of the Institute, its Scientific Supervisor, the Corresponding Member of the USSR Academy of Medical Sciences. And in that case, his word, as a surgeon, was much more superior to the word of M.M.Tarasov, the Director of the Institute, the Healthcare System organizer.

So, 1962 was over. It was 1963 coming, a decisive year in V.P. Demikhov's destiny. His desire to transplant the heart to a human was announced to the whole world.

But his desire did not coincide with the capabilities of the Sklifosovsky Institute. And V.P. Demikhov decided to make a desperate step.

(To be continued)

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10. Human heart to be transplanted. *The Times*. 1962, Dec. 5.

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Information about the author

Sergey P. Glyantsev, Prof., Dr. Med. Sci., Head of the Department of the History of Cardiovascular Surgery at A.N. Bakoulev National Medical Research Center for Cardiovascular Surgery, Head of the Medical History Unit within the Medical History Department at N.A. Semashko National Research Institute of Public Health, ORCID:0000-0003-2754-836X