

## Fifty Years of Nephrology in Serbia

Djukanovic Ljubica

Academy of Medical Science, Serbian Medical Society, Belgrade, Serbia

**Keywords:** nephrology development; dialysis; Serbia

Late last year, Serbian nephrologists celebrated the fiftieth anniversary of nephrology in Serbia with several meetings and one monograph. On this occasion, this article is prepared with the aim to present persons and events that marked development of nephrology in Serbia.

Although modern nephrology started its development 50 years ago, kidney diseases were focused already in the Serbian medieval medicine. A paper on uroscopy (Chilandari Medical Codex no. 517) specifies that conclusions on the nature and severity of diseases were drawn on the basis of appearance of the urine [1]. In addition, several medieval treatment handbooks contain recommendations on treatment of kidney diseases [2].

Over centuries nephrology was developing within internal medicine and pediatrics. Physicians of these specialties treated renal diseases and wrote the initial publications in the area of nephrology [3,4].

Pioneers of nephrology in Serbia. In 1957 Vojislav Danilovic described endemic nephropathy, later named Balkan endemic nephropathy (BEN) [5]. He incited studies of BEN that became one of main forces for further development of nephrology in Serbia and a main subject of collaboration with nephrologists of other Balkan countries and worldwide. In 1958 V. Danilovic organized a symposium on nephrophatology as the first educational nephrology meeting for internal medicine residents [6].

In 1957 Vasilije Jovanovic defended the first PhD thesis in nephrology [7] and in 1958 he was appointed the head of the newly founded Nephrology Ward of the City Hospital in Belgrade, the first specialized nephrological ward in Serbia.

In the late fifties and early sixties, more physicians who had already started pursuing nephrology were referred abroad for advanced training. The first among them were sent to the Hopital Necker in Paris to study with the famous nephrologist, professor Jean Hamburger. These were Vasilije Jovanovic, Stevan Savin, Sveto Susa, Nada Calic-Perisic and Branislav Stojimirovic. Upon their return, they founded nephrology units at university centers in Serbia [8].

Development of hemodialysis in Serbia. After his training in the Necker Hospital, in 1962 V. Jovanović was the first to apply hemodialysis for treatment of acute renal failure in Serbia [9]. In 1969 he initiated regular hemodialysis treatment for patients in end-stage renal disease [10]. Prospects opened with dialysis for treatment of acute and chronic renal failure have made an impetus to development of nephrology in

Serbia. Professor Jovanović's ward and thereafter other university nephrology units became the educational centers for dialysis.

In the late seventies and early eighties the wide hemodialysis center network was developed in Serbia (Figure 1) and the hemodialysis treatment was applied in the state-of-the-art manner. In many centers, particularly those affiliated with universities, in addition to standard hemodialysis biofiltration, paired filtration dialysis was also applied, biocompatible and large surface membranes were used. In the nineties, economic sanctions against Yugoslavia resulted in a serious economic crisis, so that the hemodialysis centers experienced shortages of consumables for hemodialysis, spare parts for repair of the equipment and machines. Mortality rate of hemodialyzed patients was on the rise, and numerous diseases and disorders that accompany uremia were not treated properly. About 1020 patients requiring hemodialysis arrived with several waves of refugees from Croatia, Bosnia, and Kosovo and Metohija, together with a substantial number of those with transplanted kidneys [11]. Moreover, all university centers and Military Medical Academy managed a large number of injured victims of war with acute renal failure (over 160 in two main only: 96 at the Military Medical Academy and 72 at the Clinical Center of Serbia) [12]. This was an additional burden for already overburdened and pauperized hemodialysis centers. In the last eight years, the situation in the hemodialysis centers has improved substantially, the treatment has become more effective and appropriate, so that the mortality rate is receding again [13]. Peritoneal dialysis. The treatment method was first applied in patients with acute renal failure: in 1955 at the Urology Hospital in Belgrade, 1963 at the City Hospital and "A" Internal Medicine Department, 1964 at Military Medical Academy, 1968 at the Children's Hospital [10,14,15]. At the City Hospital due to shortage of capacities for hemodialysis, intermittent peritoneal dialysis was tried in 1974 under out-patient conditions. CAPD was introduced at the Zvezdara University Medical Center (previous City Hospital) in 1980 followed soon in other institutions, as well [8].

Development of kidney transplantation. After initial kidney transplantations at the Urology Clinic (1975) a Department of Transplantation Nephrology was set up (1977) headed by Ivanka Krasojević-Kostić and the number of transplantations continuously expanded. During the years of sanctions and wars number of transplantations diminished although the kidney transplantation team maintained continuity in spite of shortages of drugs and other therapeutic and diagnostic supplies [16].

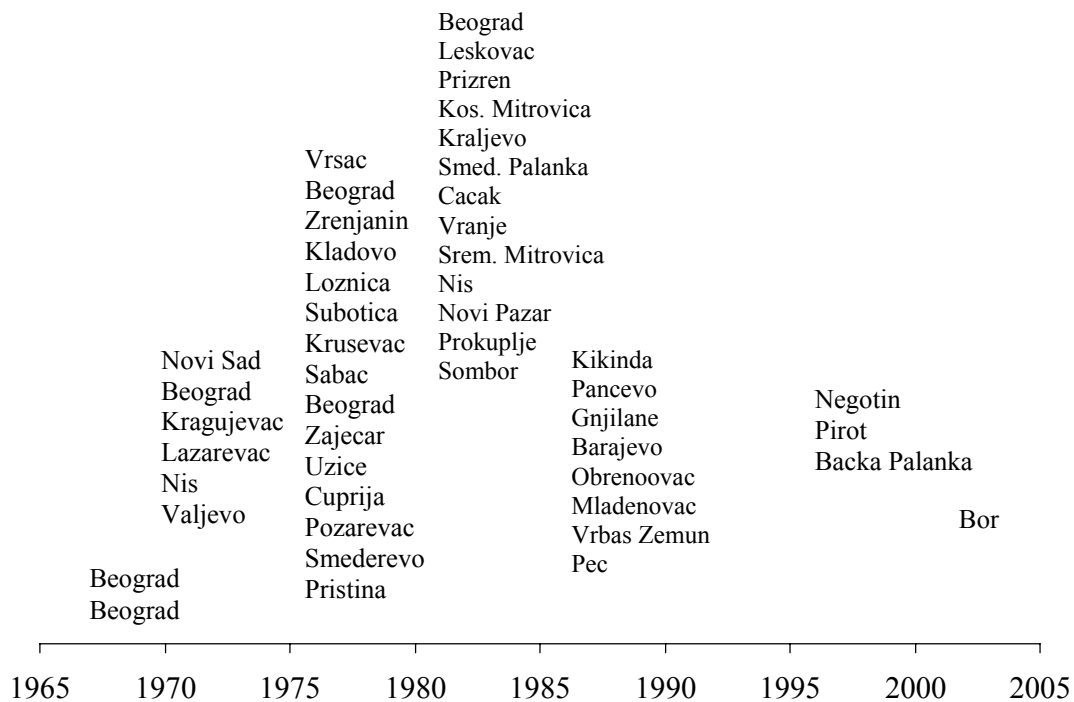


Fig. 1. Chronology of hemodialysis treatment initiation in Serbia

In 1986, kidney transplantations were initiated in Novi Sad, and Milana Popović-Rolović organized kidney transplantation in small children. In 1996 the first kidney transplantations were initiated at the Military Medical Academy in Belgrade [8,17,18].

In 1997, the Department of Nephrology of the Clinical Center of Serbia as the reference institution, established, in collaboration with the Yugoslav Association of Nephrologists, the Register of dialysis and kidney transplant patients in Yugoslavia [19]. Development of other branches of nephrology. A large number of uremic patients that necessitated development of dialysis and the challenge of BEN have made their mark on nephrology in Serbia in the seventies. In the late seventies and early eighties nephrologists increasingly started to deal with clinical, morphological and immunological research of glomerular diseases. The first to embrace the problems more extensively were pediatric nephrologists: Angelina Cvoric and Milana Popovic-Rolovic [20]. Studies of Miodrag Sindjic, our pioneer nephropathologist, were particularly important. Initial kidney biopsies were made in the early seventies, and then only seldom, surgically in several university centers. In 1977 at the "A" Internal Medicine Department, Bojana Anojcic introduced blind percutaneous biopsy of the kidneys, and in the same year Vladimir Ilic in Novi Sad performed kidney biopsy under x-ray control. The method was subsequently introduced to other nephrological departments in Belgrade and Niš, and ten years later ultrasound guided renal biopsy came onto scene in all university centers. Nowadays, over 300 kidney biopsies are performed each year in Serbia. Owing to commitment of Slobodan Curic, President of Association of Nephrologists of Serbia and Montenegro (2002-2006) the Kidney Biopsy Register of Serbia and Montenegro was set up in 2003 [21]. At the same time, protocols for

the treatment of glomerular diseases reflecting the latest advances and experiences of the leading international center have been developed.

Simultaneously, in numerous nephrological centers in Serbia other diagnostic and therapeutic methods were developed: functional kidney investigations, sonography, Duplex Doppler, plasmapheresis, CAPD, and the IT center was also set up.

**Advanced training of our nephrologists abroad.** Most of the first Serbian nephrologists studied in Paris, and subsequent generations of nephrologists went not only to Paris in Necker and Tenon Hospitals (Prof J Grunfeld, Prof. J Man, Prof. M Broye, Dr R Habib, Prof. J Richet, Prof. JD Sraer, Prof. R Ardaillou) and Lyon (Prof. J. Trager, Prof. J. L. Touraine), but increasingly more commonly to London (Prof. JS Cameron, Guy's Hospital, Prof. A Rees, Hammersmith Hospital, Prof. R Moorhead u Royal Free Hospital), USA (Prof. P. Ivanovich, Northwestern University, Chicago; Prof. M. Suthanthiran, Cornell University, New York) and Germany (Prof. J. Tarnow, University Hospital Dueseldorf; Prof. J. Floege, Department of Nephrology and Immunology, University Clinic, Aachen).

Acknowledgment is due to Professor J.S. Cameron of the Guy's Hospital in London, and Professor D. Oreopoulos of the Toronto Western Hospital who were always willing to receive our doctors for advanced training and collaboration. Professor A. Bohle (Tübingen) contributed greatly to development of Serbian nephropathology, since he provided training for our nephropathologists and his invaluable support. In the desperate nineties M. E. Debroe (Department of Nephrology-Hypertension University of Antwerp, Edegem/ Antwerp) provided training for our physicians as well as support and collaboration in interesting and important research project [8].

**Postgraduate study in nephrology.** In 1976/77 postgraduate course in nephrology was launched at the Faculty of Medicine in Belgrade. In 1979 the Postgraduate Departments of Nephrology were set up in Belgrade, Niš and Novi Sad.

In 1991 the Postgraduate Nephrology Department started a series of regular updates in nephrology, and in 1994 the first School of Dialysis was held in Leskovac. Ljubica Djukanovic initiated and led these first update courses that took place regularly owing to successful collaborations among leading nephrologists from university centers and their collaboration with all nephrologists in Serbia.

Nephrology lecturers are authors of numerous nephrology textbooks as well as chapters on kidney diseases in textbooks of pediatrics, internal medicine, urology, etc. [17,22-25].

Nephrological Association. In 1967 the Nephrology Section of Serbian Medical Society was founded and Vasilije Jovanović was elected the President. The Section has been active ever since. The members of the Section initiated establishment of the Yugoslav Nephrological Association which was founded in 1975 in Nis, and Vojislav Danilovic was elected the first President. The First Scientific Meeting of the Yugoslav Nephrological Association was held in Struga (Macedonia) in 1977 [26]. The Nephrology Section of the SMA organized the First Yugoslav Congress of Nephrology that was held in Belgrade in 1979 [27].

In the late eighties of the twentieth century Belgrade won the organization of the XXVIII ERA-EDTA Congress in September 1991. The organization was entrusted to the Yugoslav Association of Nephrology and SMA Nephrology Section. Vladimir Petronic from Belgrade was elected the Congress President, while Momir Polenakovic from Skopje was the Secretary General. With the members of the Local Organizing Committee they have practically completed all preparations. The third announcement of the Congress with the Program was composed and distributed to all members of ERA-EDTA in the spring 1991. The outset of disintegration of Yugoslavia and fights in Slovenia, then in Croatia and unfavorable political and security situation prevented the Congress to be held in Belgrade. Instead, it took place in Rimini.

Members of the SMA Nephrology Section and Yugoslav Association of Nephrology were among the organizers of the Balkan Cities Association of Nephrology, Dialysis, Transplantation and Artificial Organs (BANTAO). The third BANTAO congress was held in Belgrade in 1998 (President of BANTAO and the Third Congress: Lj. Djukanovic) and also in 2007 (President of the Congress and subsequently of BANTAO: V. Nestic).

Nephrology Section and Association of Nephrologists of Serbia and Montenegro organized three meetings entitled "Update in Nephrology" in collaboration with ERA-EDTA and ISN (organizer: N. Dimkovic); the Nephrology Section in collaboration with the Macedonian Nephrological Association organized two joint meetings of Serbian and Macedonian nephrologists (organizers: M. Polenakovic and S. Pljesa). In September 2006 Association of Nephrologists of Serbia organized the XVIII Danube Symposium in Novi Sad (organizer: S Curic).

Following the example of the European Association of Nurses in Nephrology, in 1989 the Yugoslav Association of Nurses and Technicians in Nephrology, Dialysis and

Transplantation was set up. From 1990, this Association organizes regular congresses every year.

Association of Chronic Renal Patients, Patients on Dialysis and Transplanted Patients was established in 1976 and in the course of previous decades they tried to improve organization and quality of their treatment and rehabilitation in close collaboration with nephrologists and relevant responsible institutions.

## References

1. Hilendarski medicinski kodeks N<sup>o</sup> 517 (*Chilandari Medical Codex no. 517*). Katić, R, editor and translator. Narodna biblioteka Srbije & Decije Novine, Gornji Milanovac, Beograd: 1989.
2. Medicinski spisi Hodoskog zbornika (*Code of Hodosh*). (translation Katić R). Narodna biblioteka Srbije & Decije novine & BIGZ, Beograd, Gornji Milanovac: 1990.
3. Horovic H. Patogeneza i klinicka slika albuminurije. *Srp arh* 1911; 17(9): 499-509.
4. Stanojevic L. Teorija i praksa odredjivanja bubrezne funkcije. Stampa Tucovic, Belgrade: 1928.
5. Danilovic V, Djuriscic M, Mokranjac M, Stojimirovic B, Zivojinovic J, Stojakovic P. Nephrites chroniques provoquées par l'intoxication au plomb par voie digestive (farine). *Presse med* 1957; 65(90): 2039-40.
6. Prvi simpozijum iz nefrologije. *Medicinski glasnik* 1959; 13(8-9).
7. Jovanovic V. Mehanizam funkcionalnog prilagodjavanja bubrega kod hronicne bubrezne insuficijencije za odrzavanje nekih homeostatskih sistema. PhD thesis. Medicinski fakultet, Univ. Beograd, Beograd: 1957.
8. Djukanovic Lj, editor. Prilozi za istoriju nefrologije u Srbiji. BIGZ Publishing, Beograd: 2007.
9. Jovanovic V, Mirkovic D, Balabanic V, Andrejevic Lj. Vestacki bubreg. Nasi prvi rezultati. *Srp Arh Celok Lek* 1964; 92: 861-7.
10. Jovanovic V *et al.* Uremija - klinika i lecenje. Medicinska knjiga, Beograd-Zagreb: 1974.
11. Djukanovic L, Radovic M, Bakovic J, Budosan I, Bukvic D, Cveticanin A, *et al.* Epidemiology of end-stage renal disease and current status of hemodialysis in Yugoslavia. *Int J Artif Organs* 2002; 25(9): 852-9.
12. Ostric V, Radovic M, Stanojevic P, Djukanovic Lj. Acute renal failure in polytraumatized patients: prediction of outcome. *Ren Failure* 1996; 18: 607-13.
13. Radovic M, Stosovic M, Nestic V, Curic S, on behalf of SCG Registry of Dialysis and Transplantation. Survival analysis of incident hemodialysis patients in Serbia and Montenegro. XVIII Danube Symposium of Nephrology, 2006. Abstract book, pp. 107.
14. Petkovic S, Borisov Dj, Ostojic B. Peritonealna dijaliza u lecenju akutnih renalnih insuficijencija. *Srp Arh Celok Lek* 1956; 1: 3-13.
15. Rolovic M, Perisic N, Smiljanic S, Jankovic M. Intermitentna peritoneumska dijaliza u lecenju akutne tubulske insuficijencije bubrega u dece. *Srp Arh Celok Lek* 1970; 98: 583.
16. Lezaic V, Djukanovic Lj, Marinkovic J, *et al.* Analiza rezultata transplantacije bubrega u Beogradu. *Srp Arh Celok Lek* 2000; 128(5-6): 159-156.

17. Lezaic V, Djukanovic Lj, editors. Transplantacija bubrega. Zavod za udzbenike i nastavna sredstva, Beograd: 2004.
18. Hrvacevic R, Ignjatovic Lj, Maric M, *et al.* Analiza cetvorogodisnjeg pracenja rezultata transplantacije bubrega od zivog srodnog davaoca. *Vojnosanit Pregl* 2000; 57(6): 635-640.
19. Djukanovic Lj, Hadzi-Djokic J, Djordjevic V, Radovic M. Godisnji izvestaj o lecenju dijalizama i transplantacijom bubrega u Jugoslaviji, 1997. KC Srbije, Beograd: 1998.
20. Popovic-Rolovic M. Glomerulonefritis, 1st edition. Medicinska knjiga, Beograd, Zagreb: 1984.
21. Registar biopsija bubrega Srbije i Crne Gore za 2002. godinu. Udruzenje nefrologa SCG, Novi Sad: 2004.
22. Neskovic M, Jovanovic B. Bolesti bubrega. Medicinska knjiga, Beograd-Zagreb: 1960.
23. Djukanovic Lj, Ostric, V, editors. Bolesti bubrega. Zavod za udzbenike i nastavna sredstva, Bograd: 1999.
24. Djordjevic V. Hemodijaliza. Prosveta, Nis: 1995.
25. Maksic Dj, editor. Peritoneumska dijaliza . Calibris, Beograd: 2005.
26. Zbornik radova Prvog naucnog sastanka nefrologa Jugoslavije. Dokumenta, e/12. Galenika, Beograd: 1977.
27. Zbornik radova Prvog kongresa nefrologa Jugoslavije. Dokumenta, Galenika, Beograd: 1979.