

## Modern View on Hemodynamic Parameters in Arteriovenous Fistula for Hemodialysis (Literature Review)

V. S. Koen, T. V. Zahmatova

North-West State Medical University named after I. I. Mechnikov Ministry of Healthcare  
Russia

---

### Abstract

The social and economic importance of the chronic kidney disease at the terminal stage is caused by expensive methods of treatment, number of hemodialysis patients that increases annually and the fact that most of them are of working-age. The most preferred vascular access for hemodialysis is the arteriovenous fistula, however its dysfunction occurs at more than 30 % of cases. Adequate long-term fistula functioning depends on its successful maturation, early diagnostics and elimination of vascular access possible complications. The main diagnostic method of the arteriovenous fistula dysfunction is duplex ultrasound that allows to determine diameters, the walls condition and vessels lumen, access flow, to reveal such complications as stenosis of the inflow artery, anastomosis zone and outflow vein, fistula thrombosis, hand ischemia syndrome. Ultrasound diagnostics of vascular access complications allows to provide its early correction that increases duration of fistula adequate functioning.

**Key words:** Arteriovenous Fistula, Hemodialysis, Duplex Ultrasound, Stenosis, Thrombosis, Hand Ischemia.

---

### References

1. *Alferov S. V.* Hemodynamic disorders in different arteriovenous accesses for hemodialysis. Dis. ... kand. med. nauk. Saint Petersburg, 2013. 162 p. (in Russian).
2. *Vasil'ev A. N., Miheeva J. S., Smirnov A. V.* Pathophysiology of arteriovenous fistula. *Nefrologiya*. 2015. V. 19. No. 66. P. 61–72 (in Russian).
3. *Grinev K. M.* Ways to improve the diagnostics and surgical treatment of hemodynamic complications of arteriovenous fistulas for hemodialysis. Dis. ... doct. med. nauk. Saint Petersburg, 2016. 215 p. (in Russian).
4. *Grinev K. M., Karpov S. A., Alferov S. V.* Non-thrombotic complications of permanent vascular access for hemodialysis and methods of its surgical treatment. *Vestnik SPbGU. Medicina*. 2017. V. 12. No. 4. P. 340–353 (in Russian).
5. *Gurkov A. S.* Blood flow in forearm and hand vessels in patients with arteriovenous fistula for hemodialysis. Dis. ... kand. med. nauk. Saint Petersburg, 2014. 189 p. (in Russian).
6. *Manafov Je. N.* Permanent vascular access for hemodialysis: surgical tactics. Dis. ... kand. med. nauk. Moscow, 2015. 109 p. (in Russian).
7. *Popov A. N.* Optimal variants of long-term functioning arteriovenous fistulas in hemodialysis patients. Dis. ... kand. med. nauk. Ekaterinburg, 2015. 129 p. (in Russian).
8. *Hatchinson S. J., Holms K. K.* Ultrasound diagnostics in angiology and vascular surgery. Moscow: GEOTAR-Media, 2018. 400 p. (in Russian).

9. *Shol'c H.* Vascular access for hemodialysis. Per. s angl. Pod red. A. S. Gurkova. Moscow: Prakticheskaya medicina, 2019. 280 p. (in Russian).
  10. *Agarwal A. K., Shah R., Haddad N.J.* Access blood flow testing. *Seminars in dialysis.* 2014. V. 27. No. 6. P. 595–598.
  11. *Aragoncillo I., Abad S., Caldés S. et al.* Adding access blood flow surveillance reduces thrombosis and improves arteriovenous fistula patency: a randomized controlled trial. *JVA.* 2017. V. 18. No. 4. P. 352–358.
  12. *Huber T. S., Larive B., Imrey P. B. et al.* Access-related hand ischemia and the hemodialysis fistula maturation study. *J. Vasc. Surg.* 2016. V. 64. No. 4. P. 1050–1054.
  13. *Ishii T., Suzuki Y., Nakayama T. et al.* Duplex ultrasound for the prediction of vascular events associated with arteriovenous fistulas in hemodialysis patients. *JVA.* 2016. V. 17. No. 6. P. 499–505.
  14. *Itoga N. K., Ullery B. W., Tran K. et al.* Use of a proactive duplex ultrasound protocol for hemodialysis access. *J. Vasc. Surg.* 2016. V. 64. No. 4. P. 1042–1049.
  15. *Ladenheim E. D., Lulic D., Lum C. et al.* First-week postoperative flow measurements are highly predictive of primary patency of radiocephalic arteriovenous fistulas. *JVA.* 2016. V. 17. No. 4. P. 307–312.
  16. *Pietryga J. A., Little M. D., Robbin M. L.* Sonography of arteriovenous fistulas and grafts. *Seminars in dialysis.* 2017. V. 30. No. 4. P. 309–318.
  17. *Quencer K. B., Kidd K., Kinney T.* Preprocedure Evaluation of a dysfunctional dialysis access. Elsevier. 2017. V. 20. No. 1. P. 20–30.
  18. Vascular Access Work Group. KDOQI Clinical practice guideline for hemodialysis adequacy: 2015 Update. *AJDK.* 2015. V. 66. No. 5. P. 554–930.
- 

## Authors

**Koen Valeriya Sergeevna**, Postgraduate, Department of Radiology, North-West State Medical University named after I. I. Mechnikov, Ministry of Healthcare Russia.  
Address: 41, ul. Kirochnaya, St. Petersburg, 191015, Russia.  
Phone number: +7 (921) 573-71-52. E-mail: valerii.koen@gmail.com  
ORCID.org/0000-0002-3280-5714

**Zakhmatova Tatiana Vladimirovna**, M. D. Med., Associate Professor, Department of Radiology, North-West State Medical University named after I. I. Mechnikov, Ministry of Healthcare Russia.  
Address: 41, ul. Kirochnaya, St. Petersburg, 191015, Russia.  
Phone number: +7 (905) 283-43-65. E-mail: tvzakh@mail.ru  
ORCID.org/0000-0001-8253-2382