

## Real-time Elastography in Liver Fibrosis Assessment: Method, Features, Analysis of Errors and Artifacts (Lecture)

N. A. Postnova<sup>1,2</sup>, A. V. Borsukov<sup>3</sup>, T. G. Morozova<sup>3</sup>,  
B. B. Iliasov<sup>4</sup>, A. A. Lozhkevich<sup>5</sup>, M. V. Arushanyan<sup>5</sup>

<sup>1</sup> Moscow State University of Medicine and Dentistry named after A. I. Evdokimov, Ministry of Healthcare of Russia, Department of Radiology

<sup>2</sup> The Main Clinical Hospital of the Ministry of Internal Affairs of Russia, Moscow, Russia

<sup>3</sup> Smolensk State Medical Academy, Ministry of Healthcare of Russia

<sup>4</sup> Rostov-on-Don Regional Consultative and Diagnostical Center, Rostov-on-Don, Russia

<sup>5</sup> «Image Processing Systems», Moscow, Russia

---

### Abstract

In this lecture we expounded method of compression elastography of liver with Hitachi Hi Vision ultrasound systems (Hitachi Real-time Tissue Elastography – HI-RTE). We described sequence of steps for accomplishing of this method and demonstrated features of images getting. We carried out analysis of artifacts which is necessary to take into consideration during selection of elasto images for calculating of Liver Fibrosis Index – quantitative parameter of liver parenchyma's stiffness at diffuse liver diseases with compression elastography.

**Key words:** Ultrasound Diagnostics, Compression Elastography, Diffuse Liver Disease.

---

### References

1. *Osipov L. V.* Technology in ultrasound elastography. Overview Medicinskij alfavit. Diagnosticheskaja radiologija i onkoterapija. 2013. No. 3–4. C. 5–21. (in Russian).
2. *Rudenko O. V., Safonov D. V., Rihtik P. I., Gurbatov S. N., Romanov S. V.* Physics of elastography. Compression elastography (Lecture. Part 1). Radiologija – praktika. 2014. No. 3. P. 47–58 (in Russian).
3. *Colombo S., Buonocore M., Del Poggio A., Jamoletti C., Elia S., Mattiello M., Zabbialini D., Del Poggio P.* Head-to-head comparison of transient elastography (TE), real-time tissue elastography (RTE), and acoustic radiation force impulse (ARFI) imaging in the diagnosis of liver fibrosis. *J. Gastroenterol.* 2012. No. 4 (47). P. 461–469.
4. *Cosgrove D., Piscaglia F., Bamber J., Bojunga J., Correas J.-M., Gilja O. H., Klauser A. S., Sporea I., Calliada F., Cantisani V., D'Onofrio M., Drakonaki E. E., Fink M., Friedrich-Rust M., Fromageau J., Havre R. F., Jenssen C., Ohlinger R., Săftoiu A., Schaefer F., Dietrich C. F.* EFSUMB Guidelines and Recommendations on the Clinical Use of Ultrasound Elastography. P. 2: Clinical Applications. URL: <http://www.thieme-connect.de/products/ejournals/pdf/10.1055/s-0033-1335375.pdf?update=true> (Published on-line: 2013).
5. *Fujimoto K., Tatsumi C., Ueshima K., Shiina T., Tonomura A., Mitake T., Yamamoto K., Kudo M., Kato M.* Evaluation of liver fibrosis in diffuse liver disease using real-time tissue elastography.

Digestive Disease Week. May 30th – June 4th. 2009. Chicago, USA. P. 1774. URL: <http://www.hitachi-medical-systems.eu> (Published on-line).

6. *Gheonea D. I., Săftoiu A., Ciurea T., Gorunescu F., Iordache S., Popescu G. L., Belciug S., Gorunescu M., Sandulescu L.* Real-time sono-elastography in the diagnosis of diffuse liver diseases. *World Journal of Gastroenterol.* 2010. V. 14. No. 16. P. 1720–1726.
7. *Ochi H., Hirooka M., Koizumi Y., Miyake T., Tokumoto Y., Soga Y., Tada F., Abe M., Hiasa Y., Onji M.* Real-time tissue elastography for evaluation of hepatic fibrosis and portal hypertension in nonalcoholic fatty liver diseases. *Hepatology: Official Journal of the American Association for the Study of Liver Diseases.* 2012. V. 56. No. 4. P. 1271–1278.
8. *Koizumi Y., Hirooka M., Kisaka Y., Konishi I., Abe M., Murakami H., Matsuura B., Hiasa Y., Onji M.* Liver fibrosis in patients with chronic hepatitis C: noninvasive diagnosis by means of real-time tissue elastography – establishment of the method for measurement. *Radiol.* 2011. V. 258. No. 2. 610–617.
9. *Tatsumi C., Kudo M., Ueshima K., Kitai S., Takahashi S., Inoue T., Minami Y., Chung H., Maekawa K., Fujimoto K., Akiko T., Takeshi M.* Noninvasive evaluation of hepatic fibrosis using serum fibrotic markers, transient elastography (FibroScan) and real-time tissue elastography. *Intervirol.* 2008. No. 51. Suppl. 1. P. 27–33.

---

## Authors

**Postnova Nadezhda Anatolievna**, Ph. D. Med., Assistant of Department of Radiology, Moscow State University of Medicine and Dentistry named after A. I. Eydokimov, Ministry of Healthcare of Russia, Head of Ultrasound Department of Main Clinical Hospital of the Ministry of Internal Affairs of Russia.

Address: Narodnogo Opolcheniya ul., 35, Moscow, 123060, Russia.  
Phone number: +7 (916) 601-16-64. E-mail: [npostnova17@mail.ru](mailto:npostnova17@mail.ru)

**Borsukov Alexei Vasilievich**, M. D. Med., Professor, Director Problem Scientific Laboratory «Diagnostic Techniques and Miniinvasive Technology» Smolensk State Medical Academy, Ministry of Healthcare of Russia.

Address: Normandia-Neman ul., 98-198, Smolensk, 214510, Russia.  
Phone number: +7 (4812) 63-22-10. E-mail: [bor55@yandex.ru](mailto:bor55@yandex.ru)

**Morozova Tatiana Gennadievna**, Ph. D. Med., Senior Researcher of Problem Scientific Laboratory «Diagnostic Techniques and Miniinvasive Technology» Smolensk State Medical Academy, Ministry of Healthcare of Russia.

Address: Solnechnai ul., 21, s. Bogorodickoe, Smolensk Region, 214510, Russia.  
Phone number: +7 (910) 767-45-60. E-mail: [t.g.morozova@yandex.ru](mailto:t.g.morozova@yandex.ru)

**Ilyasov Boris Bayanovich**, Ph. D. Med., Head of Ultrasound Department of Regional Consultative and Diagnostic Center, Rostov-on-Don.

Address: Pushkinskaya ul., 127, Rostov-on-Don, 344010, Russia.  
Phone number: +7 (928) 229-71-64. E-mail: [boris.ilyasov@yandex.ru](mailto:boris.ilyasov@yandex.ru)

**Lozhkevich Aleksandr Aleksandrovich**, Expert in Ultrasonic Diagnostic System of Image Processing Systems.

Address: Kutuzovskii prosp., 14, Moscow, 121248, Russia.  
Phone number: +7 (917) 579-54-82. E-mail: [a.logkevich@gmail.com](mailto:a.logkevich@gmail.com)

**Arushanyan Murad Vladimirovich**, Expert in Ultrasonic Diagnostic System of Image Processing Systems.

Address: Kutuzovskii prosp., 14, Moscow, 121248, Russia.  
Phone number: +7 (915) 338-03-03. E-mail: [m.arushanyan@ips-med.ru](mailto:m.arushanyan@ips-med.ru)