

Shear Wave Elastography in the Diagnosis of Metastatic Lesions of Peripheral Lymph Nodes

Yu. V. Kabin¹, O. V. Kostash¹, A. I. Gromov², S. L. Shvyrev³, V. V. Kapustin^{1,2}

¹ Moscow Municipal Oncology Hospital No. 62, Moscow Healthcare Department

² Moscow State University of Medicine and Dentistry named after A. I. Evdokimov, Ministry of Healthcare of Russia, Department of Radiology

³ Federal Research Institute for Health Organization and Informatics, Ministry of Healthcare of Russia

Abstract

464 patients were included to our study. The patients cohort was consist of: 214 female with histologically verified breast cancer (46,1 %); 51 patients with skin melanoma (11 %); head and neck cancers (except for thyroid cancer) were diagnosed in 123 patients (26,5 %) and thyroid cancer was revealed in 76 patients (16,4 %). The age of all patients was 19–76 y.o. (median – 57 y.o.). In all patients, metastatic changes were suspected in the different lymph nodes localization. According to the morphological examinations results, all patients of each malignancy were divided into two subgroups: with the proved lymph nodes metastases and with lymphoid tissue hyperplasia. The values of the Young's modulus for metastatic and hyperplastic lymph nodes were calculated in the each malignancy group. The Young's modulus values significant differences between metastatic and hyperplastic lymph nodes changes were revealed for all groups ($p < 0,0001$). The best levels of diagnostic efficacy (Se – Sp – AUROC) for the lymph nodes metastasis detection were achieved by the following cut-off: the breast cancer – $\geq 37,1$ kPa (82,3–88,1–0,92); the skin melanoma – $\geq 22,7$ kPa (86,0–76,9–0,91); the head and neck malignancies (except for the thyroid cancer) – $\geq 32,2$ kPa (89,7–84,6–0,90); the thyroid cancer – $\geq 46,5$ kPa (83,0–91,7–0,86).

Key words: Ultrasound Elastography, Shear Wave Elastography, Lymph Nodes, Young's Modulus.

References

1. *Alymov Yu. V.* Evaluation of ultrasound in the modes of elastometry and elastography in the diagnosis of subclinical regional metastases of oral mucosa cancer. Head and neck tumors. 2017. V. 7. No. 1. P. 31–41 (in Russian).
2. *Kaprin A. D., Starinsky V. V., Petrova G. V.* The Status of Oncological Healthcare of Russia Population in 2017. Moscow, 2018 (in Russian).
3. *Kostash O. V., Kabin Yu. V., Smekhov N. A. et al.* Shear wave elastography in recognition of metastatic axillary lymph nodes in women with breast cancer. Ultrasound and Functional Diagnostics. 2017. No. 3. P. 22–31 (in Russian).
4. *Savelyeva N. A., Kosova A. L.* Possibilities of multiparametric ultrasound diagnostics using compression elastography in detecting metastatic lesions of peripheral lymph nodes. Ultrasound and Functional Diagnostics. 2016. No. 4. P. 26–37. (in Russian)
5. *Frolova I. G., Choinzonov E. L., Goldberg V. E. et al.* Radiation methods of investigation in the complex diagnosis of lymphogenous metastasis in patients with laryngeal and hypopharyngeal cancer. Siberian Oncological Journal. 2018. V. 17. No. 3. P. 101. (in Russian).

6. *Azizi H., Keller J. M., Mayo M. L. et al.* Shear wave elastography cervical lymph nodes: predicting malignancy. *Ultrasound Med Biol.* 2016. V. 6. No. 42. P. 1273–1281.
7. *Denis M., Bayat M., Mehrmohammadi M. et al.* Update on breast cancer detection using comb-push ultrasound shear elastography. *IEEE Trans. Ultrason. Ferroelectr. Freq. Control.* 2015. V. 9. No. 62. P. 1644–1650.
8. *Desmots F., Fakhry N., Mancini J. et al.* Shear wave elastography in head and neck lymph node assessment: image quality and diagnostic impact compared with B-mode and Doppler ultrasonography. *Ultrasound Med. Biol.* 2016. V. 42. No. 2. P. 387–398.
9. *Durmaz M. S., Sivri M.* Comparison of superb micro-vascular imaging (SMI) and conventional Doppler imaging techniques for evaluating testicular blood flow. *J. Med. Ultrason.* 2018. V. 45. No. 3. P. 443–452.
10. *Evans A., Rauchhaus P., Whelehan P. et al.* Does shear wave ultrasound independently predict axillary lymph node metastasis in women with invasive breast cancer? *Breast Cancer Res. Treat.* 2014. V. 143. No. 1. P. 153–157.
11. *Youk J. H., Son E. J., Kim J. A., Gweon H. M.* Pre-operative evaluation of axillary lymph node status in patients with suspected breast cancer using shear wave elastography. *Ultrasound Med. Biol.* 2017. V. 8. No. 43. P. 1581–1586.
12. *Kim H., Kim J. A., Son E. J. et al.* Quantitative assessment of shear-wave ultrasound elastography in thyroid nodules: diagnostic performance for predicting malignancy. *Eur. Radiol.* 2013. V. 23. No. 9. P. 2532–2537.
13. *Park A. Y., Kim J. A., Son E. J. et al.* Shear-wave elastography for papillary thyroid carcinoma can improve prediction of cervical lymph node metastasis. *Ann. Surg. Oncol.* 2016. V. 23. Suppl. 5. P. 722–729.
14. *You J., Chen J., Xiang F. et al.* The value of quantitative shear wave elastography in differentiating the cervical lymph nodes in patients with thyroid nodules. *J. Med. Ultrason.* 2018. V. 2. No. 45. P. 251–259.

Author

Kabin Yuriy Vyacheslavovich, Ph. D. Med., Radiologist of Ultrasound Diagnostics Department, Moscow Municipal Oncology Hospital № 62, Moscow Healthcare Department.

Address: 27, pos. Istra, Krasnogorskiy district, Moscow Region, 143423, Russia.

Phone number: +7 (495) 563-01-10. E-mail: yu-kabin@yandex.ru

Косташ Ольга Владимировна, врач отделения ультразвуковой диагностики ГБУЗ «Московская городская онкологическая больница № 62 Департамента здравоохранения города Москвы».

Адрес: 143423, Московская область, Красногорский район, пос. Истра, д. 27.

Тел.: +7 (495) 5367-01-10. Электронная почта: kostash2012@yandex.ru

Kostash Olga Vladimirovna, M. D. Med., Radiologist of Ultrasound Diagnostics Department, Moscow Municipal Oncology Hospital № 62, Moscow Healthcare Department.

Address: 27, pos. Istra, Krasnogorskiy district, Moscow Region, 143423, Russia.

Phone number: +7 (495) 5367-01-10. E-mail: kostash2012@yandex.ru

Gromov Alexander Igorevich, M. D. Med., Professor, Professor of Department of Radiology, Moscow State University of Medicine and Dentistry named after A. I. Evdokimov, Department of Radiology, Ministry of Healthcare of Russia.

Address: 9a, ul. Vucheticha, Moscow, 127206, Russia.

Phone number: +7 (495) 611-01-77. E-mail: gai8@mail.ru

Shvyrev Sergey Leonidovich, Ph. D. Med., Deputy Head Procedural Service Department of Regulatory and Reference Information Conducting, Ministry of Health of the Russian Federation, Federal Research Institute for Health Organization and Informatics, Ministry of Healthcare of Russian.

Address: 11, ul. Dobrolybova, Moscow, 127254, Russia.

Phone number: +7 (903) 183-78-54. E-mail: sergey.shvyrev@gmail.com

Kapustin Vladimir Viktorovich, M. D. Med., Associated Professor of Department of Radiology, Moscow State University of Medicine and Dentistry named after A. I. Evdokimov, Department of Radiology, Ministry of Healthcare of Russia, Head of Ultrasound Diagnostics Department, Moscow Municipal Oncology Hospital No. 62, Moscow Healthcare Department.

Address: 27, pos. Istra, Krasnogorskiy district, Moscow Region, 143423, Russia.

Phone number: +7 (495) 563-02-42. E-mail: wwkapustin@yandex.ru