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Stereotactic biopsy and laser ablation of the ganglioglioma using a thulium laser: a video case report

Albert A. Sufianov[1,2,3,✉], Ivan S. Shelyagin[1], Rinat A. Sufianov[2]
[1]Federal Centre of Neurosurgery
5, 4th km Chervishevskogo tract, Tyumen, 625032, Russia
[2]Sechenov First Moscow State Medical University (Sechenov University)
8/2, Trubetskaya str., Moscow, 119991, Russia
[3]Peoples' Friendship University of Russia (RUDN University)
6, Miklukho-Maklaya str., Moscow, 117198, Russia

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CONTACT INFORMATION:
Albert A. Sufianov, Dr. of Sci. (Medicine), Professor, Corresponding Member of RAS, Head of Federal Centre of Neurosurgery; Head of the Department of Neurosurgery, Sechenov First Moscow State Medical University (Sechenov University); Professor, Peoples' Friendship University of Russia (RUDN University)
Address: 5, 4th km Chervishevskogo tract, Tyumen, 625032, Russia
Tel.: +7 (909) 190-24-65
E-mail: sufianov@gmail.com

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Стереотаксическая биопсия и лазерная абляция ганглиоглиомы тулиевым лазером: клинический видеослучай

А.А. Суфианов[1,2,3,✉], И.С. Шелягин[1], Р.А. Суфианов[2]

[1]ФГБУ «Федеральный центр нейрохирургии» Минздрава России
4-й км Червишевского тракта, д. 5, Тюмень, 625032, Россия
[2]ФГАОУ ВО «Первый Московский государственный медицинский университет им. И.М. Сеченова» Минздрава России (Сеченовский Университет)
ул. Трубецкая, д. 8, стр. 2, г. Москва, 119991, Россия
[3]ФГАОУ ВО «Российский университет дружбы народов»
ул. Миклухо-Маклая, д. 6, г. Москва, 117198, Россия

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КОНТАКТНАЯ ИНФОРМАЦИЯ:
Суфианов Альберт Акрамович, д-р мед. наук, профессор, член-корреспондент РАН, главный врач ФГБУ «Федеральный центр нейрохирургии» Минздрава России; зав. кафедрой нейрохирургии ФГАОУ ВО «Первый МГМУ им. И.М. Сеченова» Минздрава России (Сеченовский Университет); профессор ФГАОУ ВО «Российский университет дружбы народов»
Адрес: 4-й км Червишевского тракта, 5, Тюмень, 625032, Россия
Тел.: +7 (909) 190-24-65
E-mail: sufianov@gmail.com

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List of abbreviations

EEG – electroencephalogram
MRI – magnetic resonance imaging

[00:00] We present a clinical case of stereotactic biopsy and laser ablation of a ganglioglioma using a thulium laser [1, 2].

[00:07] The patient is an 11-year-old girl, presented with complaints of ambulatory epileptic seizures with impaired awareness, followed by post-seizure amnesia. In average, the patient has 8 seizures lasting 2–3 minutes per day.

The first attack, without any triggering factors, occurred at the age of 10 years old. Thereafter, similar stereotypical seizures occurred daily about 8 times a day. Currently, the patient is taking carbramazepine 200 mg/day (100 + 100).

[00:38] Transcranial video EEG (electroencephalogram) monitoring revealed interictal epileptiform activity in the right frontotemporal region [3].

[00:48] In the medial temporal pole parts of the right temporal lobe, there is a small area of hyperintense signal in T2 and Flair modes (red arrow). After the intravenous injection of contrast agent, a moderate accumulation area is detected in the structure of the above zone with a circular shape, up to 8 mm in diameter, extending to the contour of the cortical plate (red arrows) [4].

[01:14] Diagnosis: Mass lesion in the medial temporal lobe on the right. Structural focal epilepsy. Focal motor epileptic seizures with impaired awareness. Drug-resistant form. The following surgical procedure is planned: Stereotactic biopsy and laser ablation of a ganglioglioma using a thulium laser.

[01:39] The patient is positioned on the operating table with the head rotated to the left with its rigid fixation in a Mayfield clamp. After registering the patient in the neuronavigation system, the projection of the entry point of the trajectory of the upcoming stereotactic biopsy and laser ablation is mapped.

[02:01] We use the BrainLab VarioGuide as a frameless stereotactic system. After positioning it along all axes, according to the previously planned trajectory, a soft tissue incision is performed.

[02:25] A 2-mm trephination hole is made.

[02:36] A biopsy needle is then placed to the target point of the previously planned trajectory under the control of the neuronavigation system.

[03:37] A stereotactic biopsy is taken.

[03:42] The material for morphological study is collected all around the area of interest by turning the biopsy needle by 90 degrees after each successful sampling. This means that 4 samples of surgical material are taken for morphological examination.

[03:59] A titanium anchor screw is then screwed into the trephination hole, which serves as a ‘guide’ for the subsequent laser insertion.

[04:18] The correct path of the anchor screw is checked with the neuronavigation system. The required laser fibre insertion length is calculated, which in this case, is 54 mm, and it is immediately measured on the laser fibre. Then the stopper is set.

[04:33] Intraoperative MRI (magnetic resonance imaging) is performed after the stereotactic biopsy to rule out haemorrhagic complications (red arrow points to the biopsy area), and upon receiving satisfactory results, the laser is placed along the trajectory through the anchor screw (red arrows).

[04:47] A second MRI scan is performed to check that the laser trajectory is correct, after which we proceed to laser ablation. In this case, we have used a low-power mode of 5W with a total energy of 22 J/cm^2 and an ablation time of 4 seconds.

[05:12] Control MRI after laser ablation is performed to monitor the ablation area and prevent any complications early on. In this case, we see sufficient ablation area and no complications (red arrows points to the ablation area). The surgical procedure ends here, the anchor screw is unscrewed, and the postoperative wound is sutured with one cutaneous suture.

[05:34] The morphological examination has revealed a glioneuronal tumor with increased proliferative activity, which corresponds to a Grade I ganglioglioma [5].

The post-operative follow-up period is now 18 months. Complete freedom from epileptic seizures has been achieved (class I on the Engel Scale) [6].

The video can be found here:
https://youtu.be/Q_oCjJUzm-k

AUTHOR CONTRIBUTIONS

Albert A. Sufianov carried out the surgical procedure described in the submitted publication, made a major contribution to the conception and design, and supervised the scientific article writing and editing process; Ivan S. Shelyagin and Rinat A. Sufianov participated in the conception and design of the publication, preparation of materials, writing and editing the text, as well as preparing the illustrations and video. All authors approved the final version of the article and are ready to take responsibility for all aspects of the submitted publication.

ВКЛАД АВТОРОВ

А.А. Суфианов выполнил хирургическую операцию, описанную в представленном клиническом видеослучае, внес основной вклад в концепцию и дизайн, а также руководил процессом написания и редактирования статьи. И.С. Шелягин и Р.А. Суфианов участвовали в разработке концепции и дизайна статьи, подготовке материалов, написании и редактировании текста, а также подготовке иллюстраций и видео. Все авторы одобрили окончательный вариант статьи и готовы взять на себя ответственность за все аспекты представленной публикации.

Compliance with ethical standards

Consent statement. The patient's parents have consented to the submission of this "Stereotactic biopsy and laser ablation of the ganglioglioma using a thulium laser: a video case report" to the Sechenov Medical Journal.

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INFORMATION ABOUT THE AUTHORS / ИНФОРМАЦИЯ ОБ АВТОРАХ

Albert A. Sufianov✉, Dr. of Sci. (Medicine), Professor, Corresponding Member of RAS, Head of Federal Centre of Neurosurgery; Head of the Department of Neurosurgery, Sechenov First Moscow State Medical University (Sechenov University); Professor, Peoples' Friendship University of Russia (RUDN University).
ORCID: https://orcid.org/0000-0001-7580-0385

Ivan S. Sheliagin, neurosurgeon, Federal Centre of Neurosurgery.
ORCID: https://orcid.org/0000-0002-0877-7442

Rinat A. Sufianov, Assistant Professor, Department of Neurosurgery, Sechenov First Moscow State Medical University (Sechenov University).
ORCID: https://orcid.org/0000-0003-4031-0540

Суфианов Альберт Акрамович✉, д-р. мед. наук, профессор, член-корреспондент РАН, главный врач ФГБУ «Федеральный центр нейрохирургии» Минздрава России; зав. кафедрой нейрохирургии ФГАОУ ВО «Первый МГМУ им. И.М. Сеченова» Минздрава России (Сеченовский Университет); профессор ФГАОУ ВО «Российский университет дружбы народов».
ORCID: https://orcid.org/0000-0001-7580-0385

Шелягин Иван Сергеевич, врач-нейрохирург ФГБУ «Федеральный центр нейрохирургии» Минздрава России.
ORCID: https://orcid.org/0000-0002-0877-7442

Суфианов Ринат Альбертович, ассистент кафедры нейрохирургии ФГАОУ ВО «Первый МГМУ им. И.М. Сеченова» Минздрава России.
ORCID: https://orcid.org/0000-0003-4031-0540

✉ Corresponding author / Автор, ответственный за переписку