Проблемы здоровья и экологии
2020, № 4(66), с. 87–91
УДК 616-006.6-089: [616.345+616.36]

Health and ecology Issues
2020, no 4(66), pp. 87–91

Comparison of data on locoregional radiofrequency ablation therapy and surgical resection of malignant liver tumors at Gomel regional clinical oncology center

© Konstantin L. Murashko[1], Vadim A. Kudrashou[1], Aliaxei M. Yurkovskiy[2]

[1]Gomel Regional Clinical Oncology Center, Gomel, Republic of Belarus
[2]Gomel State Medical University, Gomel, Republic of Belarus

ABSTRACT

Objective: to perform a comparative analysis of postoperative complications and hospital stay terms of in-patients with malignant liver tumors after atypical liver resection and locoregional radiofrequency ablation of liver metastases.

Material and methods. We analyzed the data of 295 patients with malignant liver tumors who had undergone surgical resection or radiofrequency ablation of tumor nodes.

Results. We have systemized the direct results of locoregional radiofrequency ablation under sonographic control and liver resection. 45 patients (17.8 %) after liver resection and 1 (2.3 %) patient after radiofrequency ablation developed grade III–IV complications according to the Clavien-Dindo classification. The frequency of complications is statistically significantly lower after radiofrequency ablation. The duration of hospital stay after radiofrequency ablation therapy was 4.5 ± 2.5 days. After surgical liver resection, patients stayed in hospital for 10.7 ± 2.3 days.

Conclusion. Locoregional therapy provides a statistically significant reduction in the incidence of complications and reduces the duration of hospital stay compared to liver surgery.

Key words: *radiofrequency ablation, liver tumor, liver resection, local thermal exposure, ultrasound, X-ray, interventional radiology.*

Author contributions: Murashko K.L.,Yurkovskiy A.M., Kudryashov V.A.: research concept and design, collection of materials and creation of a sample base; obtaining experimental data; statistical data processing, editing, discussion of data, review of publications on the topic of the article, approval of the manuscript for publication.

Conflict of interest: authors declare no conflict of interest.

Sources of funding: the study was conducted without sponsorship.

FOR CITATION:
Murashko KL, Kudryashov VA, Yurkovskiy AM. Comparison of data on locoregional radiofrequency ablation therapy and surgical resection of malignant liver tumors at Gomel Regional Clinical Oncology Center. *Health and ecology Issues.* 2020;4:87–91. (In Russ.)

Сравнение данных локорегионарной радиочастотной терапии и хирургической резекции опухолевой патологии печени в Гомельском областном клиническом онкологическом диспансере

© К. Л. МУРАШКО[1], В. А. КУДРЯШОВ[1], А. М. ЮРКОВСКИЙ[2]

[1]У «Гомельский областной клинический онкологический диспансер», г. Гомель, Республика Беларусь
[2]УО «Гомельский государственный медицинский университет», г. Гомель, Республика Беларусь

РЕЗЮМЕ

Цель исследования: провести сравнительный анализ послеоперационных осложнений и сроков пребывания пациентов в стационаре при метастатическом поражении печени после атипичной резекции печени и локорегионарной радиочастотной терапией метастазов в печени.

Материал и методы. Проанализированы данные 295 пациентов с опухолевой патологией печени, которым выполнено хирургическое лечение или радиочастотная абляция опухолевых узлов.

Результаты. Систематизированы непосредственные результаты локорегионарной радиочастотной терапии под сонографическим контролем и резекции печени. Осложнения 3–4-й степени по классификации Clavien-Dindo развились у 45 (17,8 %) пациентов после резекции печени и у 1 (2,3 %) пациента после радиочастотной абляции, частота осложнений статистически значимо ниже после радиочастотной абляции. Пребывание в стационаре после локорегионарной радиочастотной терапии составило 4,5 ± 2,5 дня. После хирургической резекции печени пациенты были госпитализированы на 10,7 ± 2,3 дня.

Заключение. Локорегионарная терапия обеспечивает статистически значимое снижение частоты осложнений и позволяет сократить сроки пребывания пациентов в стационаре в сравнении с операциями на печени.

Ключевые слова: *радиочастотная абляция, опухоль печени, резекция печени, локальное тепловое воздействие, ультразвук, рентген, интервенционная радиология.*

Вклад авторов: Мурашко К.Л., Кудряшов В.А., Юрковский А.М.: концепция и дизайн исследования, сбор материалов и создание базы образцов, получение экспериментальных данных, статистическая обработка данных, редактирование, обсуждение данных, обзор публикаций по теме статьи, утверждение рукописи для публикации.

Конфликт интересов: авторы заявляют об отсутствии конфликта интересов.

Источники финансирования: исследование проведено без спонсорской поддержки.

ДЛЯ ЦИТИРОВАНИЯ:
Мурашко КЛ, Кудряшов ВА, Юрковский АМ. Сравнение данных локорегионарной радиочастотной терапии и хирургической резекции опухолевой патологии печени в Гомельском областном клиническом онкологическом диспансере. *Проблемы здоровья и экологии.* 2020;4:87–91.

Introduction

Secondary malignant liver tumors (metastatic lesions) and primary tumors have an extremely dismal prognosis. After radical surgical treatment of primary colorectal cancer (CRC), approximately 55 % of the patients [1, 2] develop liver metastases. The life expectancy of patients with colorectal cancer who do not receive treatment does not exceed 2–6 months [2].

Secondary liver damage in CRC is 20-fold more common than in tumors of primary malignancy. As many as 20 % of the patients with primary CRC initially present with metastases, while in 50 % of the patients metastases develop as metachronous tumors [3]. According to the results of post-mortem examinations, hepatic metastases were observed in 41 % of the patients who had died of colorectal cancer [4].

The necessity to perform surgery in metastatic liver cancer over the last decades proves high results of the 3- and 5-year survival rates. The latter rate makes up 35–58 % in metastatic tumor and 25–50 % in primary hepatic cancer [4–6]. It is important to distinguish a group of patients who require extended surgeries on hepatic metastases from those who can opt for minimally invasive locoregional therapy, which reduces the incidence of post-operative complications, thus, improving the patients' quality of life. Moreover, such minimally invasive locoregional therapy reduces the economic burden considering shorter periods (fewer days) of patient stay in hospital.

According to literary data, on average the incidence of postoperative complications in liver resections is 38 %, death — 14 % [14]. In non-malignant liver resection, the complication rate is 20–30 % [15].

Atypical and anatomical liver resections [7, 8] are performed during the surgical treatment of hepatic metastatic lesions.

The objective of the study is to perform a comparative analysis of postoperative complications and hospital stay terms of inpatients with malignant liver tumors after atypical liver resection and locoregional radiofrequency ablation of liver metastases.

Material and methods

295 patients with malignant liver tumors underwent surgical treatment at the Department of Abdominal Surgery and Surgical Oncology Gomel Regional Clinical Oncology Center from 2004 to 2019. The average age of the patients was from 27 to 83, 55 ± 28 years. In the group there were 141 (47.8 %) women and 154 (52.2 %) men. Two groups of the patients were formed for comparative analysis. The first group included 252 patients having undergone liver resection, 9 of whom had undergone extended hepatic resection, and 243 patients had undergone partial hepatectomy. The second group included 43 patients having undergone radiofrequency locoregional ablation therapy of liver tumors from 2015 to 2019. All the patients had undergone preliminary percutaneous trephine biopsy for histological verification of tumor pathology under ultrasound guidance.

The groups were stratified by demographic and clinical characteristics, as well as by the number of liver tumor nodes. The statistically significant differences between the groups were due to the size of the nodes: in group 1, the size and number of nodes were higher than in group 2. Having analyzied the results of the performed surgeries (tables 2 and 3), we would like to note that the differencies between the groups were as follows: significantly longer stay of patients in bed after surgical liver resection, as well as the number of complications prevailing in the first group, which was related to extensive surgical intervention.

The groups matched in terms of age (t-test, $p > 0.05$) and gender (Fisher exact, $p = 0.5$).

Group 1 (age — 59.6 years (56; 64.0)) and the experimental group (age — 62.0 years (58; 70)) were comparable in age (U-test: Z — 0.6; p = 0.56).

Statistical processing was performed using the Statistica8.0 software package (Stat Soft Inc, USA). The data are presented as medians and standard deviation (M ± SD). The comparison of expert and patient assessments was performed using the Fisher Test for two dependent groups. The critical significance level of the null statistical hypothesis (p) was taken as 0.05.

Table 1 — Ratio of surgical interventions and complications

Index		Group 1 n = 252	Group 2 n = 43	Significance of difference, p
Sexual attitude, M: F		132:120	22:21	p (f-test) = 0.5
Age, years (M ± SD)		54.4 ± 27.7	62.5 ± 20.5	p (u-test) = 0.56
Diagnosis, numberofcases	Primary liver cancer	18	4	p (f-test) = 0.4
	Liver metastases	234	39	p (f-test) = 0.9
Number of tumor nodes	1	170	30	p(f-test) = 0.5
	2–3	66	10	p(f-test) = 0.45
	More than 3	16	3	p(f-test) = 0.55
Node size, cm (M ± SD)		6.4 ± 5.5	4.4 ± 3.1	p(t-test) = 0.05

The differences between the two groups were not significant. Metastases prevailed in the diagnosis of liver damage.

A total of 59 metastases were treated using locoregional radiofrequency ablation therapy (a total of 30 (50.8 %) patients presented with a solitary tumor lesion, 10 patients (33.9 %) had 2 lesions, and 3 lesions were found in 3 (15.3 %) patients). Locoregional RFA was performed if the size of tumor lesions varied from 0.6 to 5.2 cm (2.9 ± 2.3 cm).

The presence of 5 tumor lesions up to 5 cm in diameter located in the liver parenchyma had served as an inclusion criterion for locoregional radiofrequency ablation therapy. In addition to the size and number of nodes, the following indications had been observed: the possibility of a safe access to tumors (the location of nodes is not closer than 1 cm from the portal or hepatic veins, lobar bile ducts); residual tumor after previous radiofrequency ablation or other treatment; local recurrence after previous radiofrequency ablation [2, 12]. The inclusion criteria for hepatic resection included a target surgical margin of 10–15 mm and immediate proximity or ingrowth into the lobular bile ducts.

General contraindications: since the introduction of the method up to the present time, the factors limiting the use of the ablation have remained unchanged: the patient has an artificial pacemaker; liver cirrhosis of class «C» (Child-Pugh); uncorrected blood clotting disorders (platelet count less than 50,000/m, prothrombin time coefficient less than 50 %); subcapsularly located tumors adjacent to the gallbladder, bowel loop, stomach wall [13].

The extent of cancerous damage in the liver was assessed using the sum of the longest diameters for the tumor nodal lesions [9]. In the group of patients who underwent locoregional radiofrequency therapy, the diameter varied from 1.2 to 7.5 cm, (4.4 ± 3.2cm), the dimensions of hepatic lesions requiring resection varied from 9 to 120 mm; and the average size made up 3.2 ± 1.8 cm, which corresponded to stage I–II according to the Gennari classification [11]. After the surgery, the patients in both the groups received chemotherapy.

Results

All the patients had been operated at the same oncology center, by one team of specialists, using the same technique. Postoperative supervision corresponded to the management of patients in the standard postoperative period. On the day before the surgery, the patients had had no dietary restrictions. In the evening before the operation, a subcutaneous injection of anticoagulant drugs in a prophylactic dosage had been performed. Before the patient was taken to the operating room in the department, antibiotic prophylaxis with 2nd generation cephalosporins had been done. If the operation lasted more than 4 hours, the drug was re-administered. Later, antibiotics were used only in the presence of such risk factors for infectious complications as a long operation duration, a large amount of blood loss, a history of cholangitis and other infectious processes. The anesthetic treatment included general anesthesia using gasanesthetics in combination with fentanyl and nonsteroidal anti-inflammatory drugs (NSAIDs). Postoperative complications were assessed by five grades according to the improved Clavien-Dindo classification [10].

Table 2 — Data on the complications in the postoperative period according to the Clavien-Dindo classification

Complication grades according to the Clavien-Dindo classification	Group 1 n = 252	Group 2 n = 43	The significance of the difference, p
1–2 grades, number of cases	179 (71 %)	17(39.5 %)	p (f-test) = 0.03
3–4 grades, number of cases	45 (17.8 %)	1 (2.3 %)	p (f-test) = 0.01
5 grades, number of cases	19 (7.5 %)	0	p (f-test) = 0.05

Postoperative mortality (III–IV grades) in group 1 was found in 19 patients (7.5 %).

Postoperative complications (III–IV grades) associated with the resection of primary and metastatic lesions were reported in 45 cases (17.8 %) in the group of patients who had undergone liver resection without locoregional radiofrequency ablation. After locoregional radiofrequency ablation, a total of 26 (60.5 %) patients had no complications. Minor complications which did not require treatment were reported in 17 patients (39.5 %). Hepatic abscess (Clavien-Dindo IIIa), which had developed in 1 patient (2.3 %) on day 20, was subsequently managed with ultrasound-guided percutaneous drainage. Indolent complications included mostly complex conditions, whereof vagus reactions and pain syndromes lasting up to 6 hours markedly prevailed. No cases of prolonged hemorrhage in the peritoneal cavity were reported. Postoperative mortality after locoregional therapy was not observed.

Table 3 — Data on complications after surgical liver resection in the postoperative period. III–IV grades according to the Clavien-Dindo classification

Complications after liver resection	Group1 n = 252, number of cases	Group2 n = 43, number of cases
Bile leakage from the liver resection site	8	—
Pleuritis	5	—
Subhepatic abscess	6	—
Intraperitoneal hemorrhage	3	—
Hepatic abscess	—	1
Seroma of the bed of the left hepatic lobe	4	—
Necrosis of the left lobe of the liver	2	—
Intraperitoneal hematoma	5	—
Postoperative wound infection	10	—
Thromboembolism of the pulmonary artery	2	—
Total	45 (17.8 %)	1 (2.3 %)

The bed-day of the patients at the postoperative period was (7.6 ± 2.4 мм).

The patient hospital stay after radiofrequency therapy amounted to 4.5 ± 2.5 days. After liver resection, the patients stayed in hospital for 10.7 ± 2.3 days.

The patients were discharged in the absence of deviations in the results of physical research methods, clinical complaints and normalization of laboratory tests (hepatic liver enzymes).

Thus, locoregional radiofrequency therapy is less traumatic compared to liver resection and allows achieving fewer complications and lower patient mortality. It takes less time for the patients to recover, thus reducing their hospital stay. Locoregional therapy is more cost-effective treatment.

When performing radiofrequency ablation of formations with a working diameter of more than 50 mm, the probability of complete destruction of the tumor is significantly reduced, and the risk of complications associated with the procedure increases.

The proximity of the tumor in relation to large intrahepatic vessels is a relative contraindication, since the effectiveness of radiofrequency therapy in this area can be reduced due to the effect of heat removal. Radiofrequency ablation is a safe treatment method for patients with primary and metastatic liver tumors and is not associated with a large number of complications.

Nevertheless, surgical liver resection remains the main method of treating patients with malignant tumors of the liver, has fewer contraindications and, undoubtedly, is a more radical method of treatment.

Conclusion

The analysis has showed that the use of the method of locoregional radiofrequency therapy makes it possible to decrease the rates of complications associated with liver surgery.

Locoregional radiofrequency therapy of malignant liver tumors allows shortening of hospital stay of patients and enhancing their rehabilitation potential.

Taking into account higher postoperative survival rates, surgical resection of the liver is considered reasonable in both synchronous and metachronous liver metastases.

REFERENCES

1. Truty MJ, Vauthey J-N. Surgical resection of high-risk hepatocellular carcinoma: patient selection, preoperative considerations, and operative technique. *Ann Surg Oncol.* 2010;17:1219-25.
2. Gillams AR. Radiofrequency ablation in the management of liver tumors. *Eur J Surg Oncol.* 2003;29(1)9-16.
3. Patjutko JuI, Chuchuev ES, Podluzhnyj DV, Poljakov AN, Agafonova MG. Hirurgicheskaja taktika v lechenii bol'nyh kolorektal'nym rakom s sinhronnymi metastazami v pechen'. *Onkologicheskaja Koloproktologija.* 2011;(2):13-19. (In Russ).
4. Liu LX, Zhang WH, Jiang HC. Current treatment for liver metastases from colorectal cancer. *World J Gastroenterol.* 2003;(9):193-200.
5. Patyutko Yu.I. Diagnostika i lechenie metastazov kolorektal'nogo raka v pecheni. *Rossiyskiy Med. Zhurnal.* 2009;(22):1505. (In Russ).
6. Granov DA, Tarazov PG. Rentgenojendovaskuljarnye vmeshatel'stva v lechenii zlokachestvennyh opuholej pecheni. SPb, RF: *Foliant.* 2002. 287 p. (In Russ).
7. Vishnevskiĭ VA. Kubyshkin VA, Odaryuk TS. Taktika khirurgicheskogo lecheniya bol'nykh s metastazami kolorektal'nogo raka v pechen'. V: Aktual'nye problemy sovremennoĭ khirurgii: trudy kongressa. Moskva, RF; 2003. 150 p. (In Russ).
8. Patyutko YuI. Khirurgicheskoe lechenie zlokachestvennykh opukholeĭ pecheni. Moskva, RF; 2005. 312 p. (In Russ).
9. Petrenko KN. Radiochastotnaya ablatsiya v lechenii metastaticheskogo kolorektal'nogo raka: avtoref. dis. ... kand. med. nauk. Moskva, RF; 2007. 27 p. (In Russ).
10. Dindo D., Demartines N., Clavien P. A. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. *Ann Surg.* 2004 Aug; 240(2):205-13.
11. Gennari L. et al. Proposal for a clinical classification of liver metastases. *Tumors.* 1982;Vol 68:443-49.
12. Wood TF, Pose DV, Chung M. et al. Radiofrequency ablation of 231 unresectable hepatic tumors: indications, limitations, and complications. *Ann Surg Oncol.* 2000;(7):593-600.
13. Lencioni R, Crocetti L. Loco-regional treatment of hepatocellular carcinoma. *Radiol.* 2012;(262):43-58.
14. Lai EC, Fan ST, Lu CM, Chu KM, Liu CL. Wong J. Hepatic resection for hepatocellular carcinoma. An audit of 343 patients. *Ann Surg.* 1995 Mar;221(3):291-98.
15. Capussotti L, Borgunovo G, Bouzari H, Smadja C, Grange D, Franco D. Results of major hepatectomy for large primary liver cancer in patients with cirrhosis. *Br J Surg.* 1994 Mar;81(3):427-31.

Поступила 06.11.2020
Received 06.11.2020

Принята в печать 22.12.2020
Accepted 22.12.2020

Information about authors:

Konstantin L. Murashko — ultrasound diagnostician at the Department of Ultrasound Diagnostics of the health institution «Gomel Regional Clinical Oncology Center»; e-mail: kostya199172@gmail.com; https://orcid.org/0000-0003-3997-7612

Vadim A. Kudrashou — surgical oncologist, Head of the Abdominal Oncology Ward of the health institution «Gomel Regional Clinical Oncology Center»; https://orcid.org/0000-0002-1512-8539

Aliaxei M. Yurkovskiy — Candidate of Medical Science, Associate Professor at the Department of Internal Diseases No.3 with the course of Radiodiagnostics of the EI «Gomel State Medical University»; e-mail: yurkovsky@mail.ru; https://orcid.org/0000-0003-0808-183X

Corresponding author:

Konstantin L. Murashko — e-mail: kostya199172@gmail.com

Сведения об авторах:

Мурашко Константин Леонидович — врач УЗИ отделения ультразвуковой диагностики У «Гомельский областной клинический онкологический диспансер»; e-mail: kostya199172@gmail.com; https://orcid.org/0000-0003-3997-7612

Кудряшев Вадим Андреевич — врач хирург-онколог, заведующий онкологическим абдоминальным отделением У «Гомельский областной клинический онкологический диспансер»; https://orcid.org/0000-0002-1512-8539

Юрковский Алексей Михайлович — к.м.н., доцент кафедры внутренних болезней № 3 с курсом лучевой диагностики УО «Гомельский государственный медицинский университет»; e-mail: yurkovsky@mail.ru; https://orcid.org/0000-0003-0808-183X

Автор, ответственный за переписку:

Мурашко Константин Леонидович — e-mail: kostya199172@gmail.com