

The mineral waters of Skhidnytsia spa town and their therapeutic benefits in patients after renal surgical procedures for renal cell cancer

Pasichnyk Serhiy¹, Mytsyk Yulian¹, Hozhenko Anatoly², Myrka Oleg³

¹Department of Urology, Danylo Halytsky Lviv National Medical University, Lviv, Ukraine.

²Ukrainian Research Institute of Transport Medicine of the MoH of Ukraine, Odessa, Ukraine.

³Communal Institution of Lviv Regional Council "Lviv Regional Rehabilitation Hospital" Skhidnytsia, Ukraine.

Article info

UROLOGY

Original paper

Article history:
Accepted August 17, 2021

Published online
December 22, 2021

Copyright © 2021 by
WJMI All rights reserved

Keywords:
*the mineral waters of
Skhidnytsia,
renal cell cancer,
rehabilitation,
nephrectomy,
chronic kidney disease*

Abstract

Objectives. To evaluate the effect of medicinal water of the Skhidnytsia region on rehabilitation of patients after nephrectomy for renal cell carcinoma of the kidney complicated by chronic kidney disease. **Materials and methods.** The study was conducted from 2007 to 2014. The investigators have reviewed medical records of 116 patients with renal cell cancer and concomitant chronic kidney disease. All patients have had radical nephrectomy with a therapeutic intent. All patients were randomized into two treatment groups. The first group enrolled 67 patients (31 males and 36 females); this patient subpopulation was dominated by patients diagnosed with urinary syndrome, which lasted over 3 months. Only 12 patients had glomerular filtration rate < 90 ml/sec. The patients in the first group did not have any spa resort treatment in the postoperative period. The second group enrolled 49 patients (21 males and 28 females). As in the case with patients of the first group, most patients in the second group have had urinary syndrome for more than three months. Glomerular filtration rate < 90 ml/sec was observed only in 13 patients of the second group. All patients of the second group have had spa resort treatment in the setting of the spa town of Skhidnytsia. **Results.** The duration of follow-up was 2 years. The patients returned to the spa town every six months, for a total of 4 spa resort treatment courses. The mean duration of each course was 17.9±1.3 days. Changes in creatinine level and glomerular filtration rate with time were assessed once every 6 months in both groups, for a total of 4 follow-up visits.

Corresponding author. Serhiy Pasichnyk, Department of Urology, Danylo Halytsky Lviv National Medical University, Lviv, 79010, Ukraine. +38(067)718519, pasichnykdoctua@gmail.com

Introduction.

Kidney cancer (KC) is the third by prevalence (after prostate cancer and urinary bladder cancer) among all urological cancers and the 10th among all malignancies [1, 2, 3]. KC includes many pathomorphologically diverse variants of malignant neoplastic transformation of renal tissue. Chronic

kidney disease (CKD) results from kidney damage. The most frequent causes of CKD include increased blood pressure, diabetes, infectious and inflammatory kidney disease, impaired urine outflow and renal masses. One of the early signs of emerging CKD is the so-called urinary syndrome [4].

In a broad sense, urinary syndrome (UrS) includes all qualitative and quantitative changes in urine, and in a more specific sense, it includes changes in urinary sediment, such as proteinuria, hematuria and leukocyturia. As already mentioned, urinary syndrome is regarded as one of the most important signs of urinary system disorders, stemming from laboratory-proven (statistically significant) and obvious deviation of urinary composition from normal [5, 6]. Isolated renal syndrome may develop in primary or secondary glomerulonephritis, as well as in other kidney diseases [4, 7]. However, preventing and slowing down the progression of existing CKD increases the need for adequate rehabilitation therapy in the postoperative period [8, 9, 10, 11]. Thus, as already mentioned above, the effect of mineral waters of the Skhidnytsia region in metaphylaxis of development and progression of CKD in patients with kidney cancer who have had radical nephrectomy is currently an open question, which is not fully understood [11, 12, 13, 14, 15].

Objectives.

To evaluate the effect of medicinal water of the Skhidnytsia region on rehabilitation of patients after nephrectomy for renal cell carcinoma of the kidney complicated by CKD.

Material and methods.

The study was conducted from 2007 to 2014. The investigators have reviewed medical records of 116 patients with renal cell cancer and concomitant CKD. All patients have had radical nephrectomy with a therapeutic intent. All patients were randomized into two treatment groups

(Table1). The first group enrolled 67 patients (31 males and 36 females); this patient subpopulation was dominated by patients diagnosed with urinary syndrome, which lasted over* 3 months. Only 12 patients had glomerular filtration rate (GFR) < 90 ml/sec. The patients in the first group did not have any spa resort treatment in the postoperative period. The second group enrolled 49 patients (21 males and 28 females). As in the case with patients of the first group, most patients in the second group have had urinary syndrome for more than three months. GFR < 90 ml/sec was observed only in 13 patients of the second group. All patients of the second group have had spa resort treatment (SRT) in the setting of the spa town of Skhidnytsia. In addition to a comprehensive program of physical therapy, exercise therapy and therapeutic diet, all SRT patients were taking “Naftusia” medicinal water. A comprehensive study of waters from Source No. 25 and Source No. 26 conducted by Ukrainian Research Institute for Medical Rehabilitation and Spa Medicine in 1995 has informed the development of recommendations and regimens for use of the above waters in chronic pyelonephritis, cystitis and in patients after renal surgery. It was according to the aforementioned regimen that patients in this study were receiving mineral waters as part of their rehabilitation program. Thus, patients were referred to SRT already on Day 7 to Day 10 after minimally invasive surgical interventions, and on Day 12 – Day 15 after open surgery. Based on the research, the authors have developed a technique, where recommended use of mineral water was 10 to 15 milliliters per kilogram of body weight. It is recommended to take the water (either cold or warmed to 18–20 °C) an hour before a meal, 5 times a day.

Table 1. Patient distribution across the groups.

Group 1 (n = 67)	M (n = 31)	UrS* > 3 mos.	(n = 7)
		GFR** < 90 ml/sec	(n = 24)
	F (n = 36)	UrS > 3 mos.	(n = 5)
		GFR < 90 ml/sec	(n = 31)
Group 2 (n = 49)	M (n = 21)	UrS > 3 mos.	(n = 4)
		GFR < 90 ml/sec	(n = 17)
	F (n = 28)	UrS > 3 mos.	(n = 9)
		GFR < 90 ml/sec	(n = 19)

* Urinary syndrome for more than 3 months; ** Glomerular filtration rate; M – male; F – female

The duration of follow-up was 2 years. The patients returned to the spa town every six months, for a total of 4 SRT courses. The mean duration of each course was 17.9±1.3 days. Changes in creatinine level and GFR with time

were assessed once every 6 months in both groups, for a total of 4 follow-up visits. We calculated glomerular filtration rate from the Cockcroft-Gault formula, measured in milliliters per minute per 1.73 m² of area (ml/min/1.73 m²).

Results and discussion.

At the onset of study participation, i.e. shortly after surgical treatment, there were no statistically significant intergroup differences in terms of the above assessment criteria. Median serum creatinine levels in Group 1 and Group 2 were

92.6±1.7 mmol/l and 90.3±2.1 mmol/l, (p> 0.05). Mean glomerular filtration rates in Group 1 and Group 2 were 72.3±5.8 ml/min/1.73 m² and 74.5±4.7 ml/min/1.73 m², respectively (p> 0.05). Changes in investigational parameters with time in both patient groups once every 6 months of follow-up are reflected in Tables 2 and 3.

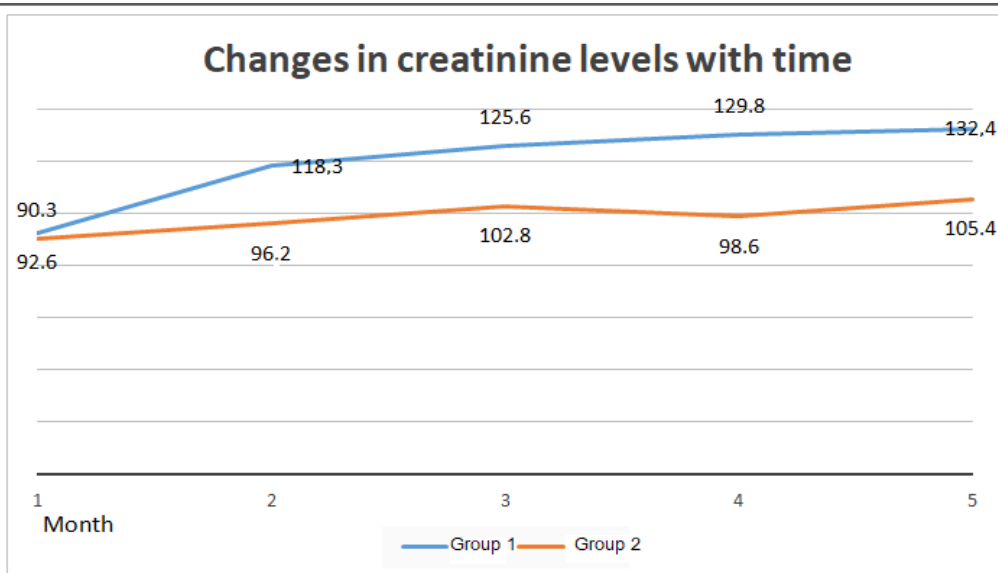
Table 2. Changes in serum creatinine levels with time.

Months	Creatinine level, mmol/l		p
	Group 1	Group 2 (SRT)	
0	92.6±1.7	90.3±2.1	>0.05
6	118.3±2.3	96.2±0.9	<0.05
12	125.6±2.9	102.8±1.6	<0.05
18	129.8±3.2	98.6±2.3	<0.05
24	132.4±3.8	105.4±3.1	<0.05

As seen from Table 2, the use of medicinal mineral waters as part of rehabilitation program in KC patients slows down their increase in creatinine levels. During the 24-month follow-up, the overall increase in creatinine level was

39.8±1.9 mmol/l in the patient group with no rehabilitation SRT and 15.1±2.4 mmol/l in the group of patients who had rehabilitation SRT. Visual presentation of the results obtained is given in Fig. 1.

Figure 1. Changes in creatinine level with time



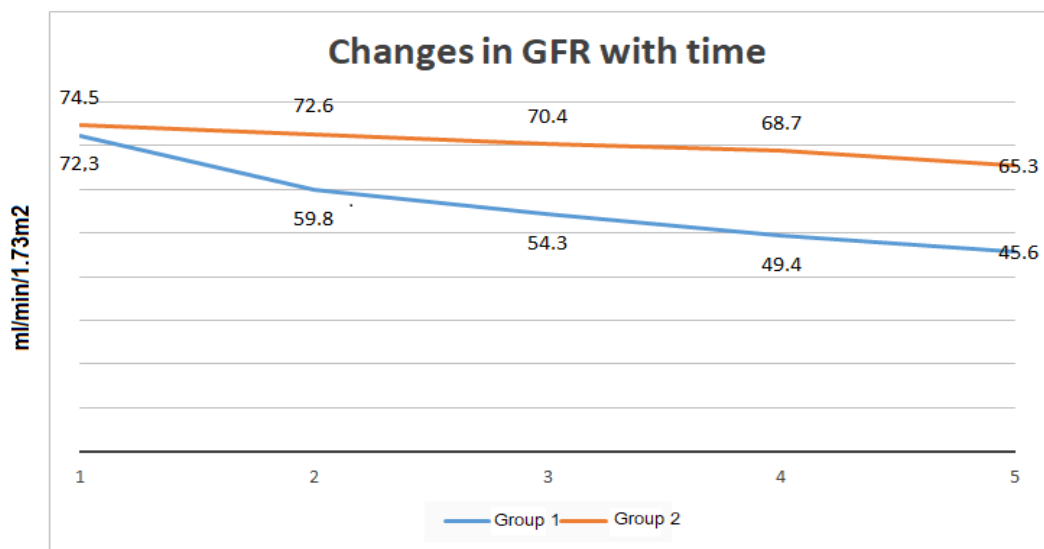
The changes in glomerular filtration rate in both patient groups are presented in Table 3. The analysis of results summarized in Table 3 shows that the use of medicinal mineral waters as part of rehabilitation program in KC patients slows down the reduction in GFR. During the 24-month follow-up, the mean reduction in GFR was 26.7±

3.4 ml/min/1.73 m² in the patient group with no rehabilitation SRT and 9.2±2.7 in the group of patients who had rehabilitation spa resort treatment in the postoperative period. Visual presentation of the results obtained is given in Fig. 2.

Table 3. Changes in glomerular filtration rate with time.

Months	Glomerular filtration rate, ml/min/1.73 m ²		p
	Group 1	Group 2 (SRT)	
0	72.3±5.8	74.5±4.7	>0.05
6	59.8±4.6	72.6±3.1	<0.05
12	54.3±5.0	70.4±2.9	<0.05
18	49.4±3.2	68.7±3.6	<0.05
24	45.6±4.3	65.3±5.4	<0.05

Figure 2. Changes in GFR with time



Analysis of the data presented in Table 4 suggests that radical nephrectomy leads to progression of existing urinary syndrome and reduction of GFR below 90 ml/sec already in

the first 6 months after the surgical treatment. The use of rehabilitation SRT had no effect on progression of urinary syndrome.

Table 4. Progression of urinary syndrome after radical nephrectomy.

Months	Group 1 (n = 67)				Group 2 (n = 49)			
	M (n = 31)		F (n = 36)		M (n = 21)		F (n = 28)	
	UrS* > 3 mos.	GFR** < 90 ml/sec	UrS* > 3 mos.	GFR < 90 ml/sec	UrS* > 3 mos.	GFR < 90 ml/sec	UrS* > 3 mos.	GFR < 90 ml/sec
0	7	24	5	31	4	17	9	19
6	2	29	1	35	2	19	4	24
12	1	30	0	36	0	21	1	27
18	0	31	0	36	0	21	0	28
24	0	31	0	36	0	21	0	28

* Urinary syndrome for more than 3 months; ** Glomerular filtration rate; M – male; F – female

Conclusions.

During 24 months after surgical treatment, study patients experienced progression of creatinine levels. Creatinine level was higher by 24.7 ± 1.2 mmol/l in the patient group after surgical treatment for KC. During the 24-month follow-up, CKD progression was more intense in the group of patients who had no rehabilitation multi-modality treatment with the use of medicinal mineral waters after their surgical treatment for KC. Radical nephrectomy leads to progression

with no rehabilitation SRT after surgical treatment for KC. Concerning CKD progression, mean GFR was lower by 17.5 ± 2.4 ml/min/ 1.73 m² in 24 months after surgical treatment in the patient group with no rehabilitation SRT of existing urinary syndrome and reduction of GFR below 90 ml/sec already in the first 6 months after the surgical treatment. The use of rehabilitation SRT had no effect on progression of urinary syndrome.

References.

- [1] Alyaev YuG, Grigoryan ZG. Bilateral asynchronous kidney cancer. *Oncourology [Onkourologiya]* 2010; 2: 15 [Russian].
- [2] Fedorenko ZP, Hulak LO, Ryzhov AYU. The specific features of development of incidence of genitourinary cancers in Ukraine after the Chernobyl nuclear accident. *Oncourology [Onkourologiya]* 2013; 1 (9): 12 [Ukrainian].
- [3] Fedorenko ZP, Hulak LO, Mykhailovych YuY, [et al.]. Cancer in Ukraine, 2015 – 2016. *The Bulletin of the National Cancer Registry of Ukraine*, 18, Kyiv, 2017 [Ukrainian].
- [4] Evenski A, Ramasunder S, Fox W, [et al.]. Treatment and survival of osseous renal cell carcinoma metastases. *J Surg Oncol* 2012; 106: 850-855.
- [5] Moskvina LV, Andreeva YuYu, Malkov PG, [et al.]. The clinically significant morphological parameters of renal cell carcinoma. *Oncology [Onkologiya]* 2013; 4: 34-39 [Russian].
- [6] Hosokawa Yu, Tanaka N, Mibu H, [et al.]. Follow – up study of unilateral renal function after nephrectomy assessed by glomerular filtration rate per functional renal volume. *World J Surg Oncol* 2014; 12 (59): 4-6.
- [7] Huang WC, Levey AS, Serio AM, [et al.]. Chronic kidney disease after nephrectomy in patients with renal cortical tumors: a retrospective cohort study. *Lancet Oncol* 2006; 7 (9): 735-740.
- [8] Hamilton SKD, Stewart GD, McNeill A, [et al.]. Renal function after unilateral Nephrectomy. *SUMJ* 2014; 3 (2): 22 -31.
- [9] Chapman D, Moore R, Klarenbach S, [et al.]. Residual renal function after partial or radical nephrectomy for renal cell carcinoma. *Can Urol Assoc J* 2010; 4 (5): 337-343.
- [10] Ahn JS, Kim HJ, Jeon HG, [et al.]. Predictive preoperative factors for renal insufficiency in patients followed for more than 5 years after radical nephrectomy. *Korean J. Urol* 2013; 54: 303-310.
- [11] Li L, Lau WL, Rhee CM, [et al.]. Risk of chronic kidney disease after cancer nephrectomy. *Nat Rev Nephrol* 2014; 10: 135-45.

[12] Muzaale AD, Mussie AB, Wang MC, [et al.]. Risk of end – stage renal disease following live kidney donation. JAMA 2014; 311: 579-586.

[13] Simmons MN, Hillyer SP, Lee BH, [et al.]. Functional recovery after partial nephrectomy: effects of volume loss and ischemic injury. J Urol 2012; 187: 1667-1673.

[14] James MT, Hemmelgarn BR, Wiebe M, [et al.]. Glomerular filtration rate, proteinuria, and the incidence and consequences of acute kidney injury: a cohort study. Lancet 2010, 376: 2096-2103.

[15] Jemal A, Tiwari RC, Murray T, [et al.]. Cancer statistics, 2004. CA Cancer J Clin 2004; 54: 8 – 29.