Surgical Treatment of Synchronous Colorectal and Renal Neoplasms

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ABSTRACT

Background: Synchronous tumors are rare clinical entity. In most cases, they are found accidentally in the process of primary tumor staging. The detection rate of synchronous blastomas has increased over the past decades due to the advance and more frequent use of imaging modalities. Only a few cases of colorectal carcinoma (CRC) and concurrent incidental renal tumors have been reported in recent years, with their incidence rates varying as reported by different authors (0.043-4.85%).

Methods: We performed retrospective analysis of our database for patients, admitted for elective colonic resection for CRC, who had adequate preoperative staging (abdominal CT or MRI), and presented with simultaneous renal tumors. Between 2009 and 2018 we identified 1472 cases of CRC. Of them 1345 underwent radical surgery, preoperative imaging was available for 1117 patients (83%), among whom 4 were diagnosed with synchronous neoplasms (0.35%).

Results: The average age in our group was 52.5 years (43-63), with male/female ratio of 1:1. CRC was the initial diagnosis, and renal tumors were accidentally detected by CT scan in the staging process. Three of the patients had combination of rectal and left kidney cancer, and one had ascending colon cancer and right kidney cancer. All 4 patients underwent simultaneous removal of both tumors: two patients underwent open and two laparoscopic procedures.

Conclusions: Although rare, synchronous colorectal and renal tumors may be encountered, mainly thanks to preoperative diagnostic imaging. Performing simultaneous resection is safe and is not associated with increased complication rate. The laparoscopic approach is a viable option, when performed by an experienced team.

Key words: synchronous colorectal and renal tumors; simultaneous resection; laparoscopic colorectal resection; laparoscopic nephrectomy; synchronous tumors

INTRODUCTION

According to Warren and Gates criteria, primary tumors may simultaneously occur in two different organs. Additionally, patients with 2 synchronous tumors are at risk of developing other malignancies (1). Cases of coexisting colorectal and renal neoplasms do not relate to certain syndromes, such as type I and II papillary renal cell carcinoma, familial non-syndromic clear cell renal cell carcinoma, Von Hippel-Lindau syndrome, tuberous sclerosis (1). Patients diagnosed with colo-

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rectal carcinoma (CRC) are at a higher risk for renal cell carcinoma (RCC) compared to the general population, and vice versa (2). It has been suggested that both neoplasms are associated with genetic predisposition and share common pathogenetic mechanism (1-5). Synchronous tumors are believed to originate from tissues and organs of similar embryonic origin (5,6). Environmental factors (tobacco smoke, pollution, ultra-violet light, chemo- and radiotherapy, endocrine factors) may also play an important role in the development of these malignancies (5,6). In almost all of the described operable cases, the synchronous tumor was incidentally found in the setting of diagnostic imaging: ultrasonography, CT, MRI, PET/CT. Thus, one should keep in mind the potentiality of encountering synchronous second tumor, while performing staging imaging (5). In many ways it is appropriate to use one-stage surgical approach for the simultaneous removal of the neoplasms, since it does not require a second surgical intervention and anesthesia. This reduces the discomfort both for patients and their families and is financially meaningful (7).

MATERIALS AND METHODS

We performed a retrospective analysis of our database in order to identify patients with synchronous colorectal and renal neoplasms. For the purpose of this study we excluded patients with palliative surgery and those who presented at the emergency unit. Between 2009 and 2018 we identified 1472 patients with colorectal cancer (CRC). Of them 1345 underwent curative surgery and preoperative staging imaging was available in 1117 cases (83%). Synchronous CRC and renal

carcinoma were present in 4 cases (0.35%).

For the literature review, we performed a search of MEDLINE, Science Direct and Google Scholar databases and consulted the references of related articles.

RESULTS

Among the four patients with synchronous CRC and renal neoplasms 2 were men. The mean age was 52.5 years (43 – 63 years). Hereditary non-polyposis colorectal cancer (HNPCC, Lynch syndrome) was excluded in all patients, according to Amsterdam II criteria. The colorectal and renal tumors were with ipsilateral localization, with three of the patients having rectal cancer and left kidney renal cell carcinoma (RCC) and one patient – ascending colon cancer and right kidney RCC. The renal tumors were all asymptomatic and presented as an incidental finding during preoperative diagnostic work-up. All of them were at an early stage (T1N0) and showed clear-cell histologic type.

The surgeries were performed by a single team and included simultaneous colectomy and nephrectomy. Two of the operations were performed using open approach and two were done totally laparoscopically. The types of surgeries, as well as operative data is delineated in *table 1*. No major morbidity or mortality was encountered, as well as no significant impairment of renal function. The median hospital stay was 7 days (5-9). In the third case a laparoscopic abdominoperineal rectal amputation with left nephrectomy was performed with the perineal incision used for extraction of both specimens, thus obviating the need for a separate abdominal incision (*fig. 1*). The patient was supine, with open legs and the table placed in

Table 1 - Patient and tumor characteristics, types of surgeries and operative data

	Gender	Age	CrCl (mL/min)	Primary tumor	Synchronous tumor	Notes	Procedure	Operative time (min)	Post-op stay (d)
Case 1	f	43	93	Ascending colon	Right kidney	Liver metastases in Sg IV, V and VI	Right hemicolectomy and enucleation of renal tumor; Liver metastasectomies	205	8
				T3N2M1G2	T1NxM0				
Case 2	m	50	96	Rectal cancer T4NxM0	Left kidney T1bNxM0	Bowel obstruction	Hartmann procedure with left nephrectomy	135	6
Case 3	m	63	96	Rectal cancer	Left kidney		Laparoscopic abdomino- perineal resection (Miles procedure) with left nephrectomy	330	5
				T3N0M0V1	T1bNxM0				
Case 4	f	54	82	Recto-sigmoid junction T3N0M0	Left kidney T1aNxM0		Laparoscopic anterior rectal resection and left nephrectomy	210	9

Figure 1 - (a) CT-scan showing the synchronous CRC and renal tumors; (b) Macroscopic appearance after laparoscopic abdomino-perineal rectal amputation and left nephrectomy with extraction through the perineal wound

Trendelenburg position, tilted to the right. The port placement is shown in *fig. 2*. To the best of our knowledge this is the first description of such a laparoscopic approach in the literature.

DISCUSSION

According to Shiozawa, synchronous tumors can be found in 5% of all CRC patients (8). Nevertheless, coexistence of colorectal and renal cell tumors is rare. Data on the topic is scarce and is comprised of mainly single-center studies and few reports, as shown in *table 2*. According to our results, we have encountered synchronous RCC in 4 out of 1117 patients with CRC and adequate pre-operative staging, for a 13-year period. This is 0.35% of all patients, and this proportion is consistent with the range reported in the world literature (0.046 - 4.85%)(1-3, 9-13). Hereditary non-

Figure 2 - Port placement for the simultaneous laparoscopic abdomino-perineal resection and left nephrectomy with trans-perineal extraction of both specimens

Table 2 - Clinical and pathological characteristics
(Authors – in chronological order; A – Age; G – Gender; RCC – renal cell carcinoma; CRC – colorectal carcinoma)

Authors, year	A	G	Renal Tumor	Histology	Kidney Side	CRC	Histology	Colon Side	Open or Lap
Amoroso A et al., 1999	75	F	T3bNxM1	clear cell RCC	right	T3N0Mx	adenocarcinoma G3	ascending	Open
D'Amato A et al., 2000	75	M	-	clear cell RCC	right	-	adenocarcinoma	right	open
	64	M	-	clear cell RCC	left	-	adenocarcinoma	left	open
Halak M et al., 2000	80	M	Stage III	clear cell RCC	right	Stage B2	adenocarcinoma	sigmoid	open
	74	M	Stage II	clear cell RCC	right	Stage C	adenocarcinoma	left	open
	75	M	Stage II	clear cell RCC	left	Stage C	adenocarcinoma	rectum	open
	84	M	Stage III	clear cell RCC	left	Stage B2	adenocarcinoma	sigmoid	open
	82	M	Stage III	clear cell RCC	right	Stage B2	adenocarcinoma	rectum	open
Kim SH et al., 2000	55	M	T1N0M0	clear cell RCC	right	T3N2M0	adenocarcinoma	sigmoid	hand - assisted
Napolitano C et al., 2006	74	M	T1N0M0	clear cell RCC	left	T1N0M0	adenocarcinoma	descending	lap
Dalal S et al., 2006	40	M	-	clear cell RCC	right	-	adenocarcinoma	caecum	open
Simon S. M. Ng et al., 2006	73	M	5 cm	clear cell RCC	right	T3N0M0	adenocarcinoma	sigmoid	lap
	80	M	4 cm	clear cell RCC	left	T3N1M0	adenocarcinoma	descending	lap
Łuczyńska E et al., 2008	59	M	Fuhrman Grade 2	clear cell RCC	left	Astler-Coller B2	adenocarcinoma	sigmoid	open
Ahmadnia H et al., 2009	68	F	-	-	left	M0	adenocarcinoma G2	sigmoid	open
Kozokic A et al., 2010	81	M	G2	clear cell RCC	right	T3N0M0	adenocarcinoma	sigmoid	open
Spajić B et al., 2010	69	M	2.1 and 2.8 cm	clear cell RCC	left and right	T2N0M0	adenocarcinoma	rectum	open
Romero Rivera et al., 2010	77	M	T1N0M0	clear cell RCC	right	T3N0M0	adenocarcinoma	sigmoid	open
	67	F	-	angiomylipoma	right	T1N0M0	adenocarcinoma	caecum	open
	54	F	-	oncocyoma	left	T4N0M0	adenocarcinoma	sigmoid	open
	78	M	T1N0M0	clear cell RCC	right	T1N0M0	adenocarcinoma	caecum	open
	81	M	T3aN0M0	papillary RCC	left	T3N0M0	adenocarcinoma	recto-sigmoid	open
	74	F	T1bN0M0	clear cell RCC	left	T3N2M1	adenocarcinoma	caecum	open
Veenstra GM et al., 2011	70	F	T3aNxMx	clear cell RCC	left	T3N1Mx	adenocarcinoma G2	ascending	lap
Papalampos AE et al., 2011	72	F	T1bNxM0	papillary and	left	T3N0M0	adenocarcinoma G3	hepatic	open
			T1aNxM0	chromophobe RCC				flexure	
Bhargava A et al., 2012	67	F	5 cm	clear cell RCC	right	-	adenocarcinoma G2	caecum and sigmoid	open
Campanati L. et al., 2013	68	M	Fuhrman Grade 2 3.5 cm	clear cell RCC	right	T1N0M0	adenocarcinoma	sigmoid	lap
	70	M	T1bN0M0	clear cell RCC	left	T2N1M0	adenocarcinoma	sigmoid	lap
Fazzin M et al., 2013	79	F	3 cm	clear cell RCC	right	T1N0M0	adenocarcinoma G2	sigmoid	lap
Takahashi M et al., 2014	70	F	T1bN0M0	clear cell RCC	right	T3N1M0	adenocarcinoma G2	ascending	lap
Wroński K et al., 2014	78	F	T1aNxM0 G2	clear cell RCC	left	T3N2M0	adenocarcinoma G3	rectum	open
Bolognesi M et al., 2014	59	M	6.3 cm	chromophobe RCC	right	N0M0	adenocarcinoma G1	caecum	open
Arnau M et al., 2015	63	M	T1bNxM0	papillary RCC	left	T4N0M0	adenocarcinoma G2	sigmoid	lap
	67	M	T1 (left) and T3 (right)	cystic and clear cell RCC	left and right	T3, T2, T1, Tis	adenocarcinoma	sigmoid	lap
	71	M	-	papillary RCC	left	T3N0M0	adenocarcinoma G2	rectum	lap
	62	M	T3Nx	transitional cell carcinoma	right	T2N0M0	adenocarcinoma	right	lap
O'Sullivan M et al., 2015	73	M	8 cm	hybrid RCC	left	T3N0M0	adenocarcinoma	right transverse	lap
Turati L et al., 2016	29	M	2.5 cm	RCC	right	-	signet-ring cell carcinoma	rectum	open
Ramezani M et al., 2016	55	F	5 cm	clear cell RCC	left	T2N0M0	adenocarcinoma G1	right	open
Dafashy TJ et al., 2016	61	M	T1aN1M0	clear cell RCC	left	-	adenocarcinoma G3	appendix	open robotic
	36	F	T2aN1Mx	clear cell RCC	left	T1N0M0	adenocarcinoma G2	hepatic flexure	open
Lee S et al., 2017	71	F	-	clear cell RCC	left	T1N0M0	adenocarcinoma	descending	lap
Sahsamanis G. et al., 2017	81	F	Fuhrman Grade 2 3.5 cm	chromophobe RCC	left	T3N0M0	adenocarcinoma	sigmoid	open
Takorov I. et al., 2018	43	F	T1NxM0 Fuhrman Grade 3	clear cell RCC	right	T3N2M1	adenocarcinoma	ascending	open
	50	M	T1bNxM0 Fuhrman Grade 2	clear cell RCC	left	T4N1M0	adenocarcinoma	rectum	open
	63	M	T1bNxM0 Fuhrman Grade 2	clear cell RCC	left	T3N0M0	adenocarcinoma	rectum	lap
	54	F	T1aNxM0 Fuhrman Grade 1	clear cell RCC	left	T3NxM0	adenocarcinoma	rectum	lap

polyposis colorectal cancer or Lynch syndrome is a condition, associated with mutations in mismatch-repair genes and is a risk factor for early-onset CRC, as well as other malignancies (especially Lynch II syndrome) (2). However, there is no correlation to this syndrome in neither of our cases. Albeit some of the reported cases with synchronous CRC and RCC are associated with HNPCC, there is no strict correlation (1,3,7).

Obviously proper preoperative staging is mandatory when evaluating a patient with malignant solid tumor. Abdominal ultrasonography alone is not a reliable imaging method for the detection of a synchronous renal tumor because the assessment is subjective and depends on the operator's experience. Additional diagnostic imaging is required. Contrast-enhanced CT is the method of choice in such cases, as back in 1989 O'Boyle recommended the use of preoperative CT for the detection of synchronous renal neoplasms in patients with colorectal cancer (13).

Most patients in the published series are over the age of 50. In addition, the risk of urologic neoplasm increases after the diagnosis of CRC, especially in patients under 60 years of age or in those with primary multiple colorectal carcinoma (2). In our study, the mean age was 52.5 years.

The data shows a male predominance (M/F ratio 29:18), with mean age of 67 years (29 ÷ 84). The right kidney was affected in 42.5% (n = 20) of the patients and the left kidney in 57.5% (n = 27). As per the CRC, the tumors were located in the right colon in 36.2% (n = 17) of the cases, while in 63.8% (n = 30) the left colon or rectum were involved. In terms of resection side, the difference was greater, as 2/3 or 63.8% (n = 30) of all resections were ipsilateral, and 36.2% were (n = 17) contralateral. This is important for selection of surgical access and approach, both in conventional and minimally invasive one-stage interventions. According to Steinhagen et al. (1), synchronous tumors are usually diagnosed at an early stage. Our data confirms those observations with all renal tumors being asymptomatic and within stage I (according to AJCC 7th edition criteria)(14). This suggests that renal tumors develop after the colorectal cancer or progress more slowly. From a histological perspective, almost all colorectal tumors are adenocarcinomas of varying degrees of differentiation, whereas the prevalent pathomorphological type of renal tumors is clear cell carcinoma.

Surgical treatment should be radical and aggressive (4,15). When nephrectomy is planned, the kidney function is evaluated using the estimated glomerular

filtration rate (GFR), based on the Cockcroft-Gault equation. All our patients were under 65 years-of-age, and GFR was well over 60 ml/min (*table 1*). Single-stage procedure is preferred whenever feasible, as was done with every patient in our series. In one case, liver metastases were removed in addition to right hemicolectomy and renal resection, without any additional postoperative complications.

In recent years, there has been an increase in the number of mini-invasive synchronous resections. In 2004, Seon-Han Kim published an article on the first laparoscopic hand-assisted surgery (30), and in the same year Napolitano performed the first totally laparoscopic resection (31) in patients with synchronous colorectal and renal neoplasms. Recently mini-invasive interventions have become more common due to the increased experience of surgeons in performing these difficult combined surgical interventions, which require excellent technical skills and preoperative work-up. Therefore, we recommend that these interventions are only performed at specialized centers experienced in large and very large-volume laparoscopic resections. Studies on laparoscopic and open resections of CRC and RCC patients show that long-term outcomes are comparable (17). A preoperative decision should be made as to whether a synchronous or two-stage resection should be performed (18). Combined laparoscopic resection of synchronous intra-abdominal tumors is a reliable and safe approach with no evidence of additional postoperative complications. Reduced pain, shorter hospital stay, early return to normal life, much better cosmetic effects, operative time comparable to the open approach, comparable oncological results, and no port-associated implantation metastases have been observed (16,18,19). The laparoscopic resections we performed support completely this data, except for the operation time, which appeared to be shorter with open interventions. One drawback of mini-invasive synchronous kidney and colorectal resection may be the need of two separate teams – colorectal and urological, both with experience in laparoscopic surgery. In our series all cases were performed by a single team of general surgeons which greatly relieved the logistical planning of such intervention. It is our opinion that those kind of multivisceral resections can be safely practiced by a single team and it has benefits in reducing operative time and post-operative complications.

It is very important to determine the position of working ports prior to synchronous laparoscopic resection (17,19). In contralateral tumors, a change in the position of both the trocars and the patient may be required (7). Some authors recommend the simultaneous

laparoscopic approach as a reliable and safe method for colorectal and renal tumors when performed by surgeons with extensive experience in mini-invasive surgery (7,18,20). The one-stage open approach is also reliable and prevents second surgical intervention, but has some limitations, such as large surgical incision for optimal access to the different operative fields, prolonged operation time, greater blood loss, and more complications (18).

CONCLUSION

One-stage surgical treatment should be the method of choice in patients with synchronous colorectal and renal neoplasms. The laparoscopic approach is preferred as it has proven to be safe and reliable, with better short-term and comparable long-term outcomes. Synchronous laparoscopic resection by a single team is feasible in large-volume, experienced centers. Diagnosing CRC always requires contrast-enhanced imaging examinations both for precise staging of the primary disease and to rule out synchronous malignancy. Due to the small incidence rate of these tumors, additional multicenter studies are needed to provide clarity on their etiology and treatment methods.

Conflict of Interest

The authors declare no conflict of interest.

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