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Intramedullary spinal cord metastasis from colon cancer: analysis of 19 reported cases

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We report and analyze a rare entity of intramedullary spinal cord tumor, which is metastatic from colon cancer with a very poor prognosis. The reported 19 cases including our case in the literature are analyzed. Comparison of outcomes between surgery, radiotherapy and non-treatment groups are evaluated. Life distribution is profiled. Median overall survival is 75 days. The 90 days and 150 days survival rate are 42.9% and 21.4%, respectively. There were no differences between conservative treatment (non-treatment or radiotherapy) and aggressive intervention (surgery or surgery plus radiotherapy) in mortality and the trend of survival probability. The prognosis of metastatic intramedullary spinal cord tumor is poor. Surgery may only be considered in selected patients with good control of primary cancer and without evidence of lung metastases and leptomeningeal carcinomatosis.

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INTRODUCTION

Intramedullary spinal cord metastasis (ISCM) is rare and found in 0.9–2.1% of all cancer patients.¹ Lung is the major origin followed by breast cancer. Colorectal cancer accounts for about 3% of ISCM cases² and only 18 cases have been reported.³ When diagnosed, the patients are usually in an advanced stage of diseases.² Surgery and radiotherapy are usually the choices of treatment but there is no a consensus of management.

CASE REPORT AND SERIES ANALYSIS

A 66-year-old male patient has a history of ascending colon cancer (adenocarcinoma, pT3N2, grade II) diagnosed in 2012. He had neoadjuvant chemotherapy and received right hemicolectomy in October 2012. Adjuvant chemotherapy was applied but local recurrence was noted 8 months later. He had the second operation and kept adjuvant chemotherapy. Twenty-six months after the initial diagnosis, he was admitted to our hospital due to obstructive jaundice and progressive lower limbs weakness in December 2014. Abdominal computed tomography showed suspicious metastatic lymph nodes along with hepatoduodenal ligaments. Magnetic resonance imaging with enhancement identified an intramedullary spinal cord tumor at T9 level with perifocal edema (Figure 1). Obstructive jaundice was relieved with percutaneous transhepatic biliary drainage. Surgery of spinal cord tumor removal was performed then. During operation, midline myelotomy was performed after T9 and T10 laminectomy. A dark-red and soft tumor was identified and removed. Metastatic adenocarcinoma was proved by pathology examination and immunohistochemistry study (Figures 1b and c). The postoperative condition was uneventful initially but the muscle power of bilateral limbs did not improve. However, the patient had a biliary tract infection complicated with a rapid course of sepsis 2 weeks

after the surgery. He refused aggressive treatment and died within days.

There have been only 19 cases of ISCM from colorectal cancer, including our case, reported in English literature (Table 1).^{4–7} Typical initial presentations are limbs weakness and numbness, which deteriorate rapidly. The time from initial neurological symptom to full deficit may be < 1 month.^{8,9} Magnetic resonance imaging with enhancement is the modality of choice for diagnosis.⁴

Seven patients, including our case, underwent surgery; three patients received radiotherapy; two patients had surgery and then radiotherapy; two patients did not have any treatment and another four patients treatments were not available. Treatment with steroid was mentioned in three cases. The outcomes of 14 cases were described. Observed survival time is 2 weeks to 14 months. Survival analysis was calculated with Kaplan–Meier method (Figure 2a). Median overall survival is 75 days. The 90 days and 150 days survival rate are 42.9% and 21.4%, respectively. There is no difference of survival rate between conservative treatment (non-treatment or radiotherapy) and aggressive intervention (surgery or surgery plus radiotherapy). Life distribution was profiled by groups. The trends of survival probability between groups (non-treatment, radiotherapy and surgery) do not exist difference significantly. The overall trend of life distribution is shown as Figure 2b.

DISCUSSION

ISCM is an uncommon manifestation of cancer, reported to affect 0.9–2.1% of all cancer patients.¹ Metastasis from colorectal cancer is rare and reported to be 3% in all ISCMs.² Only 19 cases including our case have been reported in English literature.^{4–7} In colorectal cancer patients, those who have lung metastases have higher risk of ISCM.¹⁰ Although ISCM has been reported

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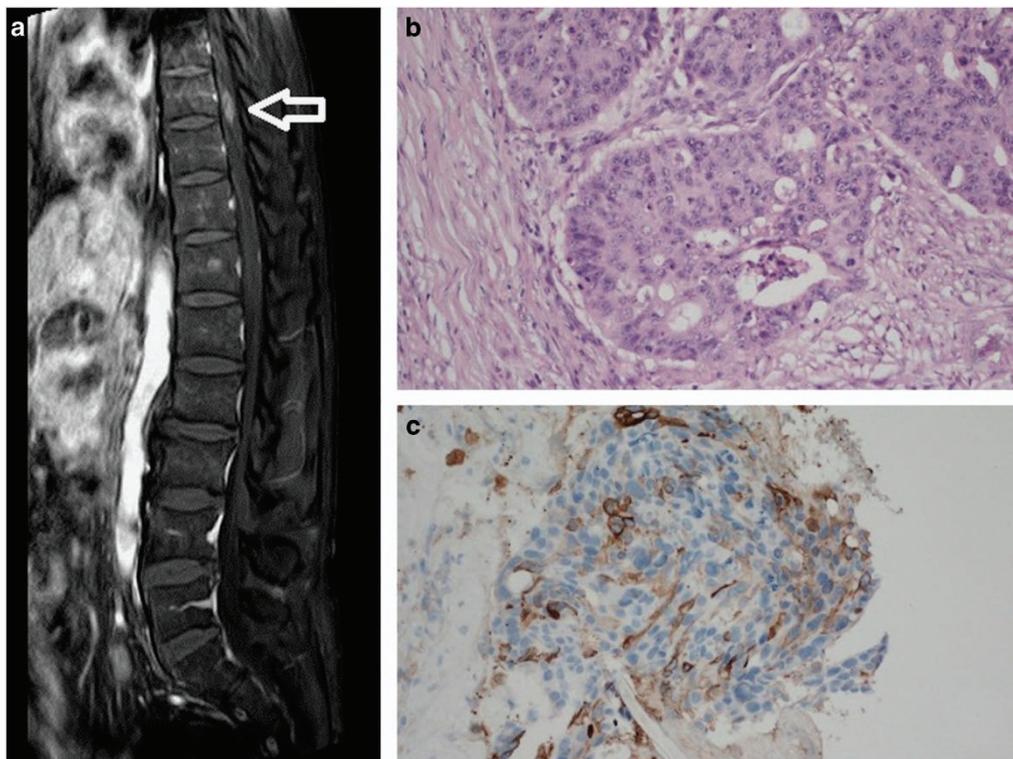


Figure 1. (a) Sagittal view of magnetic resonance imaging with enhancement showed an intramedullary spinal cord tumor at T9 level (arrow). (b) Section from the colon specimen showed adenocarcinoma composed of hyperchromatic and pleomorphic cancer cells arranged in glandular pattern with surrounding desmoplastic stroma. (c) Section from spinal cord lesion with immunohistochemistry stains showed neoplastic cells positive for cytokeratin 20 (CK20) but negative for cytokeratin 7 (CK7), caudal-related homeobox transcription factor 2 (CDX-2) and thyroid transcription factor-1 (TTF-1). The results were highly suggestive of metastatic adenocarcinoma.

Table 1. Cases with intramedullary spinal cord metastasis (ISCM) of colon cancer

No.	Authors	Year	Level	Sex	Age	Interval (cancer to ISCM)	Brain/lung metastases	Treatment	Survival after diagnosis/treatment
1	Sansory OM ¹⁷	1955	T4	F	65	NA	-/-	NA	NA
2	Silva & McSwain ¹⁸	1967	C5-6	F	55	15 months	-/+	Surgery	15 days after operation
3	Walker ¹⁹	1967	L1-2	M	56	NA	-/+	NA	NA
4	Jellinger <i>et al.</i> ²⁰	1979	T11-L2	M	77	5 years	+/+	Nil	3 weeks after admission
5		1979	C2-4	F	74	6 years	+/NA	Nil	9 days after admission
6	Foster & Crookard ²¹	1987	C4	M	66	5 years	-/-	Surgery	2 months after operation
7 & 8	Schiff & O'Neill ²²	1996	NA	NA	NA	NA	NA	NA	NA (two cases in the series but no individual details of treatment described)
9	Ogino <i>et al.</i> ¹⁰	2002	C5-6	M	69	4 months	-/-	Surgery	3 months after operation due to dyspnea
10	Yano <i>et al.</i> ²³	2002	T	NA				Surgery+RT	5 months after surgery
11	Kaya <i>et al.</i> ²⁴	2003	T6	F	44	1 year	+/NA	Surgery+steroid	14 months after operation, mediastinum metastasis
12	Grasso <i>et al.</i> ⁵	2007	C3-4	F	61	0	NA	Surgery	2 months after operation
13	Dam-Hieu <i>et al.</i> ⁹	2009	Conus	M	79	2 years	NA	Surgery+RT	5 months after operation
14	Kaballo <i>et al.</i> ²⁵	2011	C2-3	M	71	16 months	-/NA	Steroid	NA
15	Hashii <i>et al.</i> ⁴	2011	NA	NA	NA	NA	NA	RT	At least 33 weeks
16	Vassiliou <i>et al.</i> ²⁶	2012	C6-7	F	71	30 months	NA/+	RT	2 months after ISDM diagnosed
17	Lunardi <i>et al.</i> ³	2014	C7	F	74	1 year	NA	Surgery	14 months
18	Yang <i>et al.</i> ⁷	2014	T12	M	75	4 years	NA/+	RT+steroid	4 months after ISDM diagnosed
19	Su (our case)	2014	T9	M	66	26 months	-/+	Surgery	2 weeks after operation due to sepsis

Abbreviations: C, cervical; F, female; ISCM, intramedullary spinal cord metastasis; L, lumbar; M, male; NA, not available; RT, radiotherapy; T, thoracic.

to be the initial presentation of malignancy,⁵ most patients are diagnosed in an advanced stage of disease – One-third of patients had concomitant brain metastases and one-quarter had leptomeningeal carcinomatosis when ISCM was diagnosed.^{2,11-13}

As other metastatic lesions, ISCM is not curable. The goals of managements are usually achieving palliation, deferring neurological decline and sometimes for definite diagnosis. Treatment must be individualized and depends on condition of primary cancer, clinical performance and patient's expectancy.

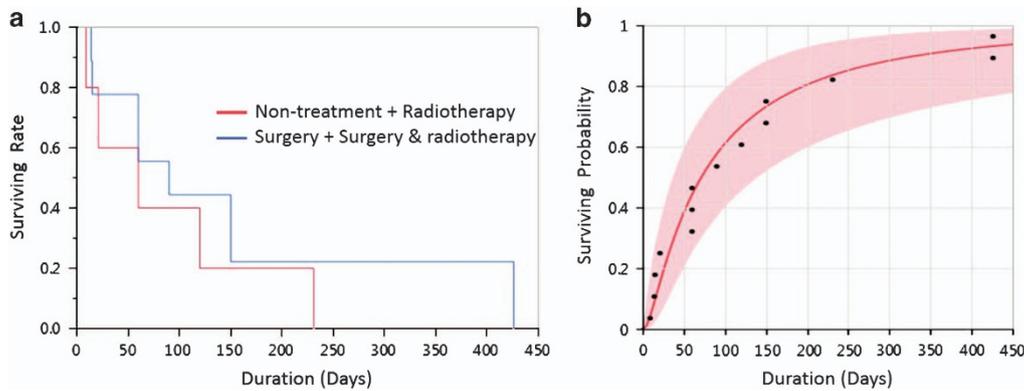


Figure 2. (a) There is no difference of survival rate between conservative treatment (non-treatment or radiotherapy) and aggressive intervention (surgery or surgery plus radiotherapy). (b) The overall trend of survival probability in 14 cases.

Our patient died of biliary tract infection 2 weeks after the surgery, a complication of lymph node metastases. Besides, disseminated metastasis of the primary cancer is usually the cause of death. Leptomeningeal carcinomatosis, multiple tumors and severe neurological impairment are relative contraindication for surgery.⁹

Recent studies have described longer survival in patients undergoing surgery.^{2,14,15} Dam-Hieu *et al.* retrospective reviewed 19 patients with ISCMs. The 13 patients who received operation have longer survival compared with those who did not (7.4 months vs 2.6 months). Moreover, 7 of the 13 operated patients had improvement of neurological status.⁹ Wilson *et al.*¹⁶ report 9 ISCM patients undergone operation and suggest operation may preserve neurological function if treated early.

Radiation is another option of treatment. It may suppress the tumor growth and expected to slow down neurological decline in radiosensitive tumors. Hashii *et al.*⁴ reported 18 ICSM patients receiving radiotherapy, the 3-month and 6-month survival rate were 54% and 36%, respectively. Median overall survival was 4 months. In the review of ISCM from colon cancer, four patients had radiotherapy and three of them died within 5 months after diagnosed of ISCM. The effect of radiotherapy varies between different pathologies and colon adenocarcinoma unfortunately is not a radiosensitive one.

There is still no guideline for management of ISCM. The treatment usually depends on physician's experience. Conservative treatment is often the first choice due to the dismal prognosis of ISCM and the poor clinical condition of the patients. Surgery has its role in ISCMs originated from colorectal cancer in selected patients. The candidates for operation may be with well-controlled of the primary cancers, no lung metastases and no leptomeningeal carcinomatosis. The functional outcome and quality of life after surgery may be improved if the intervention can be provided early.

CONCLUSION

Patients with ISCM usually have concomitant disseminated systemic metastases and have poor prognosis even under aggressive treatment. Surgical treatment may prolong survival in selected patients. More study is needed to compare the effects of radiotherapy and surgery and to figure out which groups of patients might benefit from surgery.

AUTHOR CONTRIBUTIONS

T-HT, I-CL and Y-FS conceived and designed the work that led to the submission. I-CL and Y-FS acquired data and references. P-CL had an important role in interpreting the results. T-HT, I-CL and Y-FS drafted and revised the manuscript. T-HT and I-CL contributed equally to the working as a first author. Y-FS and C-LL approved the final version.

COMPETING INTERESTS

The authors declare no conflict of interest.

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