Considering the economic impact of a simultaneous versus staged approach to resection of colorectal cancer with synchronous liver metastases in a publically funded healthcare system

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INTRODUCTION

- Select patients presenting with colorectal cancer (CRC) with synchronous liver metastases (SLM) may undergo a staged or simultaneous resection of the primary tumor and SLM with curative intent^{1,2}.
- There have been very few studies considering the economic impact of the variability in complexity and the timing of the two approaches and the implications this may have on a systems level³

OBJECTIVES

- To compare the simultaneous and staged approach to resection of colorectal cancer with SLM on an economic level in the context of a publically funded healthcare system
- To compare short term outcomes for the simultaneous versus staged approach

METHODS

- A retrospective chart review of patients receiving surgical treatment for CRC with SLM at the University Health Network (UHN) from January 2005 to July 2016 was preformed using the Electronic Patient Record (EPR)
- Of the 54 patients included in the study, 28 underwent a staged resection, and the remaining 26 patients underwent a simultaneous resection
- Continuous variables were compared using an unpaired t-test or Wilcoxon signed-rank test and categorical variables using a Chi squared or Fisher’s exact test.

RESULTS

- Patient demographics including age (p=0.49), sex (p=0.20), BMI (p=0.74), and ASA class (p=0.44) were comparable between groups [Table 1]
- Tumor characteristics including pathologic T (0.66) and N (0.23) stage, and number (0.12) and size (0.50) of metastasis were comparable . Surgical approach (laparoscopic vs open) was comparable between groups (Colon p=0.92; Liver p=0.07). Extent of resection was also not significantly different (0.90). [Table 2]
- Total operative time was significantly less for the simultaneous group (357 minutes) compared to the staged group (485 minutes) [Table 2]
- Total LOS was shorter in the simultaneous group (12 mean days vs 22 mean days) (p<0.01). The two groups were comparable with regard to Clavien-Dindo scores (p=0.96), as well as 30-day readmissions (p=0.44), morbidity (p=0.22) and mortality (p=1.00). [Table 3]
- Total cost (\$20297 vs \$27522), OR (\$6830 vs \$10376), PACU (\$675 vs \$1182), ward (\$7586 vs \$11603) and pharmacy costs (\$728 vs \$1075) were significantly less for the simultaneous group (p<0.05). [Table 4]

CONCLUSIONS

- Our study suggests that that simultaneous resection is safe, oncologically equivalent and cost-effective in comparison to staged resection in a select group of patients
- Further studies are needed to validate these findings and better understand factors associated with differences in survival.

1.Kelly ME, Spolverato G, Le GN, et al. Synchronous colorectal liver metastasis: a network meta-analysis review comparing classical, combined, and liver-first surgical strategies. *J Surg Oncol*. 2015; 111: 341-51.
2. Ejaz A, Semenov E, Spolverato G, et al. Synchronous primary colorectal and liver metastasis: impact of operative approach on clinical outcomes and hospital charges. *HPB : the official journal of the International Hepato Pancreato Biliary Association*. 2014; 16: 1117-26.

Table 1: Patient Characteristics

	Simultaneous (n= 26)	Staged (n= 28)	P Value
Sex -Male	14 (53.8)	12 (44.4)	0.494
-Female	12 (46.2)	15 (55.6)	
Age (years) - Mean [SD]	54.7 [12.9]	58.7 [9.2]	0.20
BMI (m/kg ²) -Mean [SD]	27.1 [5.3]	26.6 [5.2]	0.74
ASA Classification			
1	1 (3.8)	1(3.7)	0.44
2	3 (11.5)	8 (29.6)	
3	19 (73.1)	15 (55.6)	
4	3 (11.5)	3 (11.1)	

Table 2: Operative Data

	Simultaneous (n= 26)	Staged (n= 28)	P Value
Colorectal Resection			
Type of Colectomy			
Right	14 (53.6)	4 (14.8)	0.04*
Transverse	0 (0.0)	1 (3.7)	
Left	5 (19.2)	10 (37.0)	
AR ^a	7 (26.9)	11 (40.7)	
APR ^b	0	1 (3.7)	
Liver Resection			
Type of Hepatectomy			
Right Hepatectomy	3 (11.5)	4 (14.8)	0.85
Left Hepatectomy	3 (11.5)	1 (3.7)	
Minor Segmentectomy	9 (34.6)	9 (33.3)	
Major Segmentectomy	8 (30.8)	10 (37.0)	
Wedge Resection	3 (11.5)	3 (11.1)	
Extent of Liver Resection			
Major (≥3)	12 (46.2)	12 (44.4)	0.90
Minor (<3)	14 (53.8)	15 (55.6)	

Table 3: Operative and Short-Term Outcomes

	Simultaneous (n= 26)	Staged (n= 28)	P Value
Operative Outcomes			
Total Operative Time (min)			<0.01*
Mean [SD]	357 [110.1]	485 [120.4]	
Total Blood Loss (cc)			0.61
Mean [SD]	982 [1160.2]	1140 [877.2]	
Short Term Outcomes			
30-Day Readmission	-Yes 6 (23.1)	4 (14.8)	0.44
	-No 20 (76.9)	23 (85.2)	
30-Day Morbidity	- Yes 14 (53.8)	19 (70.4)	0.22
	- No 12 (46.2)	14 (53.8)	
30-Mortality	- Yes 0 (0.0)	0 (0.0)	
	- No 26 (100.0)	28 (100.0)	

Table 4: Cost per Episode of Care

	Simultaneous (n= 26)	Staged (n= 28)	P Value
OR, \$CAD			<0.01*
Median [IQR]	6830 (6055-8568)	10376 (8432-11910)	
PACU, \$CAD			<0.01*
Median [IQR]	675 (592-792)	1182 (764-1421)	
Ward, \$CAD			0.04*
Median [IQR]	7586 (5370-14167)	11603 (8696-15376)	
Laboratory, \$CAD			0.06
Median [IQR]	2057 (1555-2882)	2574 (1980-3247)	
Imaging, \$CAD			0.85
Median [IQR]	859 (299-2548)	815 (413-2639)	
Pharmacy, \$CAD			0.01*
Median [IQR]	728 (412-957)	1075 (708-2107)	
Total, \$CAD			0.01*
Median [IQR]	20297 (15657-30170)	27522 (23992-38227)	