Diagnostic accuracy of Pre-operative CT Scan in predicting Lesser sac disease in advanced epithelial ovarian cancer: The learning curve

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Introduction and Aims

- Lesser sac/omental (LS) involvement is reported in 60-70% of patients undergoing cytoreductive surgery (primary surgery PDS or Interval surgery IDS) for advanced epithelial ovarian cancer (AEOC).[1]

- Aims: To study whether computed tomography (CT) scan can predict the LS disease pre-operatively.

Methods

➤ Retrospective and prospective observational study between January 2014 to December 2017; data retrieved from hospital electronic medical records system.

➤ Intraoperative LS disease (lesser omentum, caudate lobe, floor, superior recess, medial and lateral foramen of Winslow): **prospectively** recorded in predesigned proforma since 2015 with laparoscopic evaluation/photographic documentation for small volume disease (Fig. 2,3).

➤ Interaction with a dedicated radiologist was started with feedback from surgeon (S4) and review of photographs of intraoperative findings of LS disease in an initial training set of 20 cases prior to commencement of the present study.

➤ CT upper abdomen within 3 weeks of surgery was **retrospectively** evaluated by the dedicated radiologist blinded to the operative findings and compared to the data available from the CT reports (**prospective**) during the study period (2014-2016) and prospective case record forms (CRF) in 2017. Results were compared across 5 time periods (table 2).

RESULTS

Table 1. Demographic and disease characteristics (2015-2017).

Characteristics	Overall (n=157)	PDS (n=86)	IDS (n=71)
Age in years (range)	52.8 (19-71)	49.4 (19-71)	54.9 (31-71)
Performance status at presentation ≥ ECOG 3	10 (6.4%)	1 (1.2%)	9 (12.7%)
LSO disease			
Present	77 (49.0%)	45 (52.3%)	32 (45.1%)
Absent	80 (51.0%)	41 (47.7%)	39 (54.9%)
FIGO stage			
III	98 (62.4%)	67 (77.9%)	31 (43.7%)
IV a	30 (19.1%)	11 (12.8%)	19 (26.8%)
IV b	29 (18.5%)	8 (9.3%)	21 (29.5%)
Histology			
Serous	142 (90.4%)	73 (84.9%)	69 (97.2%)
Non serous	15 (9.6%)	13 (15.1%)	2 (2.8%)
CA125 at presentation U/ml (range)	2104.7 (4-45315)	1349.6 (4-13868)	3023.9 (55-45315)
PCI score	16.11 (m=4)	18.5 (m=3)	13.32 (m=1)
Ascites at surgery in ml	973.69	1636.7	190.97
SCS score	8.09 (m=1)	9.14 (m=1)	6.86
CC score			
CCO GCIG: Optimal	91 (57.9%)	54 (62.8%)	37 (52.2%)
CC1 GCIG: Optimal	45 (28.7%)	21 24.4%	24 (33.8%)
CC2 GCIG: Optimal	9 (5.7%)	5 (5.8%)	4 (5.6%)
CC2 GCIG: Suboptimal	5 (3.2%)	3 (3.5%)	2 (2.8%)
CC3 GCIG: Suboptimal	7 (4.5%)	3 (3.5%)	4 (5.6%)

Table 2. Overall CT prediction of LS disease (n=194, 2014-2017) with time and training of surgeon and radiologists

Time period	2014	2015-16 a	2015-16 b	2017 1st half	2017 2nd half	Bristow et al., 2000
Evaluation (n=194)	(n=37)	(n=99)	(n=99)	(n=33)	(n=25)	(n=41)
PDS %	0	2015: 21/37 (56.7%) 2016: 36/62 (58%)		29/58 (50%)		
Intra –op LSO disease detection rate	4/37 (10.8%)	2015: 19/37 (51.3%) 2016: 29/62 (46.8%)		29/58 (50%)		
Training	Surgeon – Radiologist-	Surgeon+/- Radiologist -	Surgeon + Radiologist +	Surgeon +/- Radiologist +/-	Surgeon + Radiologist +	
CT data source	CT reports	CT reports	CT review CRF	CT reports	CT review CRF	
CT data acquisition	Prospective Unstructured	Prospective Unstructured	Retrospective Structured	Prospective Unstructured	Prospective Structured	
Surgical data acquisition	Unstructured	Structured Prospective	Structured Prospective	Structured Prospective	Structured Prospective	
Sensitivity	2/4 (50%)	11/48 (23%)	86%	6/18 (33%)	6/11 (55%)	43%
Specificity	32/33 (97%)	48/51 (94%)	84%	15/15 (100%)	13/14 (93%)	85%
PPV	2/3 (67%)	11/14 (79%)	82%	6/6 (100%)	6/7 (86%)	75%
NPV	32/34 (94%)	48/85 (56%)	87%	15/27 (56%)	13/28 (72%)	59%
DA	34/37 (92%)	59/99 (59%)		21/33 (64%)	19/25 (76%)	

Table 3. Sensitivity of CT scan in predicting LS1 (<0.5cm) versus =/>LS2 lesions in PDS and IDS

	LS1 (n=39)	≥LS2 (39)
2015 (Retrospective CT pro-forma)		
PDS (n=12)	3/3 (100%)	8/8 (100%)
IDS (n=7)	2/5 (40%)	1/1 (100%)
Total n=19	5/8 (62%)	9/9 (100%)
2016 (Retrospective CT pro-forma)		
PDS (n=16)	5/7 (71.4%)	9/9 (100%)
IDS (n=13)	5/10 (50%)	3/3 (100%)
Total n=29	10/17 (59%)	12/12 (100%)
2017- first half (Prospective CT reports)		
PDS (n=10)	1/5 (20%)	1/5 (20%)
IDS (n=8)	1/4 (25%)	2/4 (50%)
Total n=18	2/9 (22%)	3/9 (33%)
2017- second half (Prospective CT pro-forma)		
PDS (n=6)	0/1=0%	4/5 (80%)
IDS (n=5)	1/4=25%	1/1 (100%)
Total n=11	1/5 (20%)	5/6 (83%)

c: caudate lobe; lo: lesser omentum; g: groove of ligamentum venosum; m: metastasis; p: pancreas; r: retractor; s: stomach FOW: foremen of Winslow
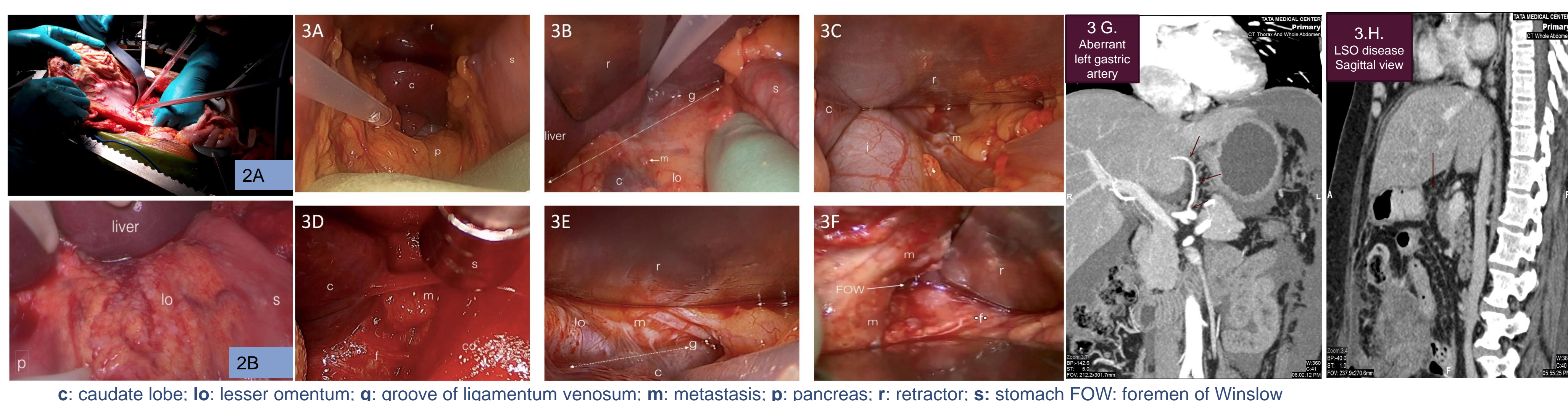
Fig. 2 &3. Systematic Intra-operative detection and CT detection tools and views

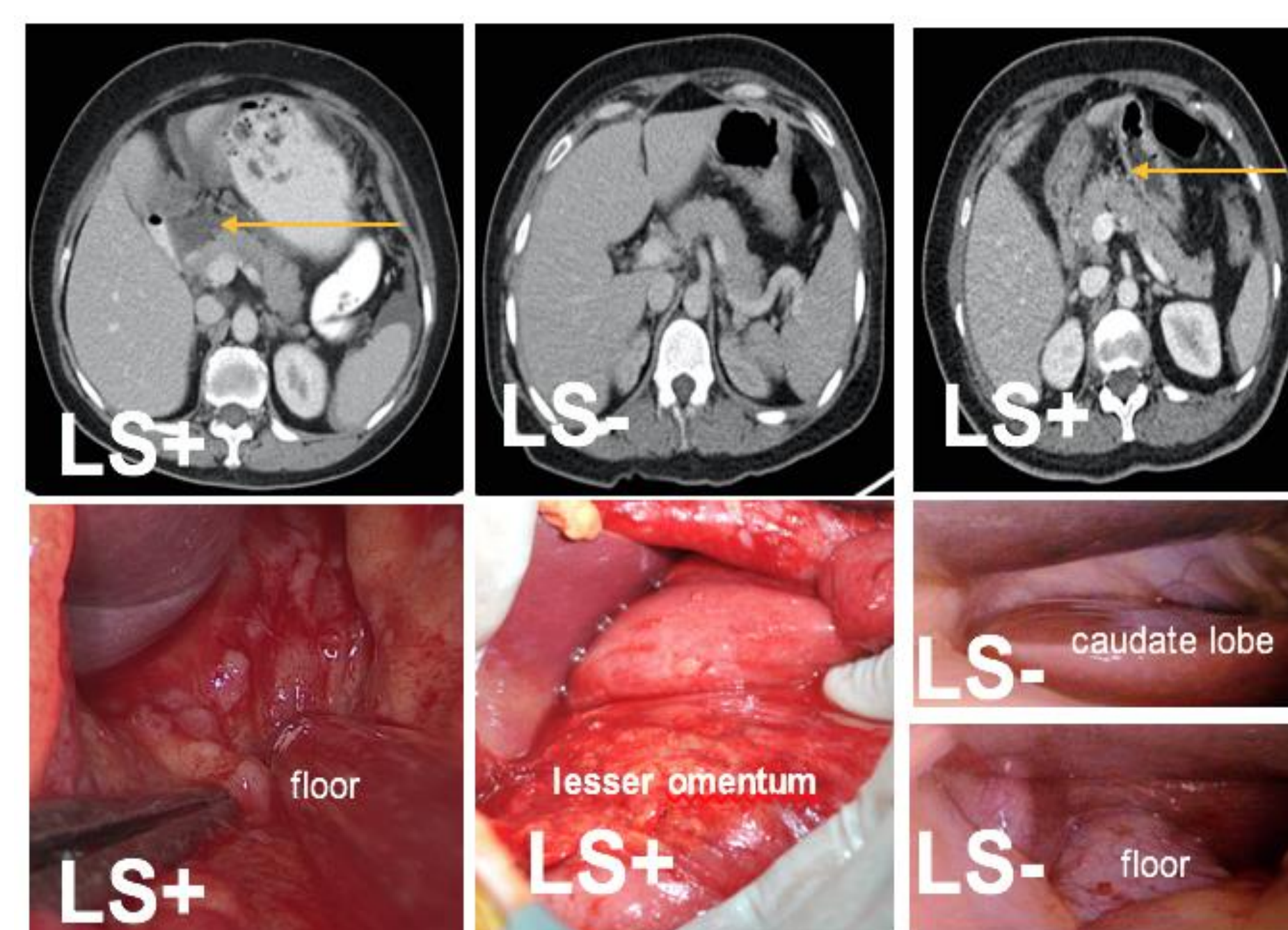**Figure 4. CT prediction vs Operative findings: Correlation and Mismatch**

Table 4. Surgical learning curve: CT prediction decreases as surgeon is better detecting at small volume LSO lesions

Surgeons	S1±S2±S3	S4/S4±1±2±3
Disease detection (2015-2016)	13/48 (27%)	29/44 (69%)
CT prediction (2015-2017)	11/29 (37%)	12/48 (25%)

Reasons for poor CT prediction:
➤ Surgeon's learning curve
➤ NACT- LSO disease present in 11/17 (64.7%) patients who had no LSO disease in post NACT scan
➤ Type of lesions: Small volume, hypodense lesions

Conclusions:

➤ LS disease is present in a significant proportion of AEOC patients. However, both prediction and detection of LS disease radiologically and during surgery requires a learning curve and bilateral communication between radiologist and surgeon.

➤ Both findings should be prospectively recorded in predesigned data sheet to improve the predictive accuracy. .

References

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