

**Cancro gastrico. L'imaging funzionale alla diagnosi nella stadiazione locale:  
correlazione con endoscopia e dato anatomo-patologico**

**L. Volterrani**

**Chieti 23 febbraio 2017**



# La TC nel cancro gastrico

Nei carcinomi ...

**Il ruolo dell'ECOG nella stadiazione inizia dopo la diagnosi !!**

BACKGROUND: Double-contrast upper gastrointestinal barium X-ray radiography (UGI-XR) is the standard gastric cancer screening method in Japan.

**Almeno nel mondo occidentale !!**

## Atrophic gastritis and enlarged gastric folds diagnosed by double-contrast upper gastrointestinal barium X-ray radiography are useful to predict future gastric cancer development based on the 3-year prospective observation.

Yamamichi N<sup>1</sup>, Hirano C<sup>2</sup>, Ichinose M<sup>3</sup>, Takahashi Y<sup>4</sup>, Minatsuki C<sup>5</sup>, Matsuda R<sup>6</sup>, Nakayama C<sup>7</sup>, Shimamoto T<sup>8</sup>, Kodashima S<sup>9</sup>, Ono S<sup>10</sup>, Tsuji Y<sup>11</sup>, Niimi K<sup>12</sup>, Sakaguchi Y<sup>13</sup>, Kataoka Y<sup>14</sup>, Saito I<sup>15</sup>, Asada-Hirayama I<sup>16</sup>, Takeuchi C<sup>17</sup>, Yakabi S<sup>18</sup>, Kaikimoto H<sup>19</sup>, Matsumoto Y<sup>20</sup>, Yamaguchi D<sup>21</sup>, Kageyama-Yahara N<sup>22</sup>, Fujishiro M<sup>23</sup>, Wada R<sup>24</sup>, Mitsushima T<sup>25</sup>, Koike K<sup>26</sup>.

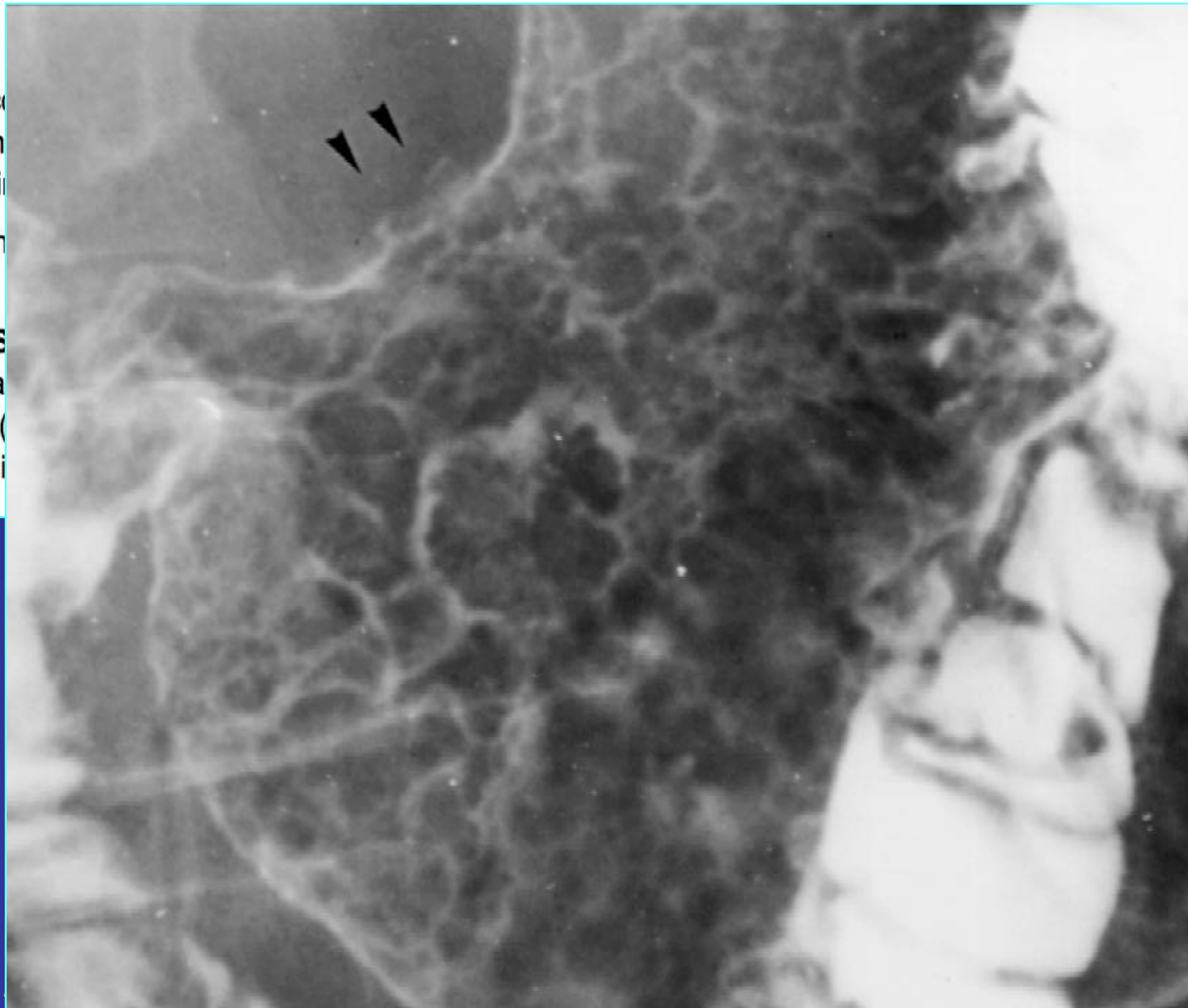
### Author information

#### Abstract

**BACKGROUND:** Double-contrast upper gastrointestinal barium X-ray radiography is a useful screening method in Japan. Atrophic gastritis and enlarged gastric folds are common findings on double-contrast upper gastrointestinal barium X-ray radiography, but the clinical meaning of evaluating these findings is unclear.

**METHODS:** We analyzed the clinical meaning of evaluating atrophic gastritis and enlarged gastric folds in patients with H. pylori infection who had taken acid suppressants.

**RESULTS AND CONCLUSIONS:** We observed atrophic gastritis and enlarged gastric folds in 10 of 100 patients with H. pylori infection and five of whom (50%) had gastric cancer. Both UGI-XR-based atrophic gastritis and enlarged gastric folds were useful to predict future gastric cancer development based on the 3-year prospective observation.



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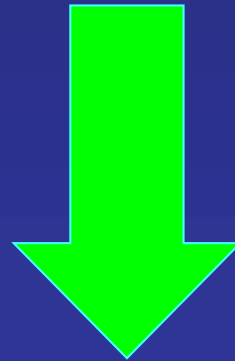
We analyzed the clinical meaning of evaluating atrophic gastritis and enlarged gastric folds in patients with H. pylori infection who had taken acid suppressants.

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# Metastasi ??

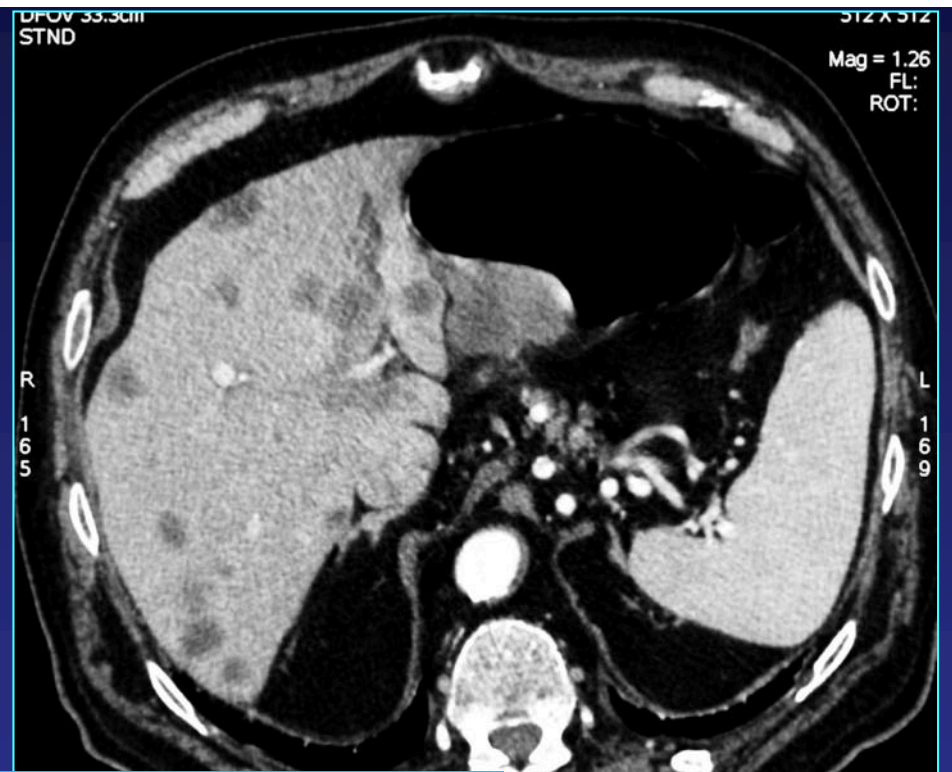
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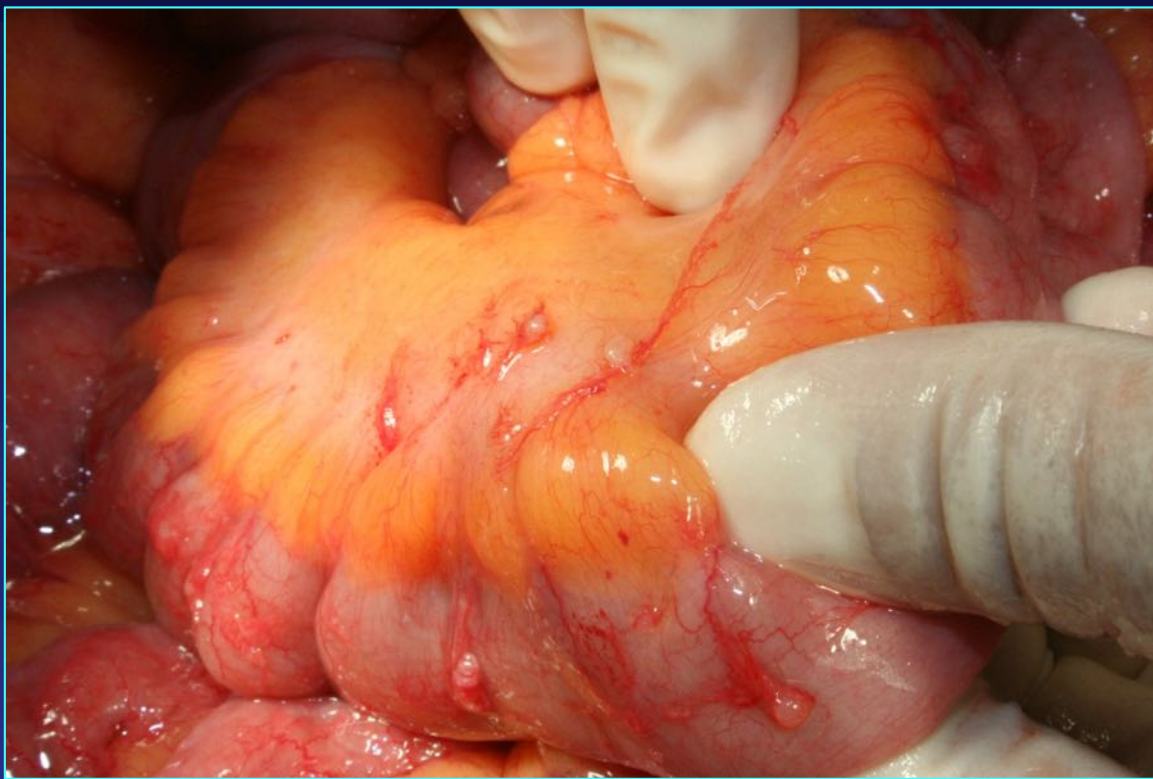
N ?



**TERAPIA**

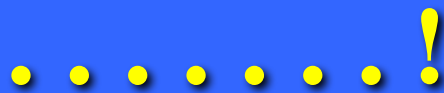






**Il chirurgo...**

**Me lo hai fatto operare !**





# ABDOMINAL IMAGING

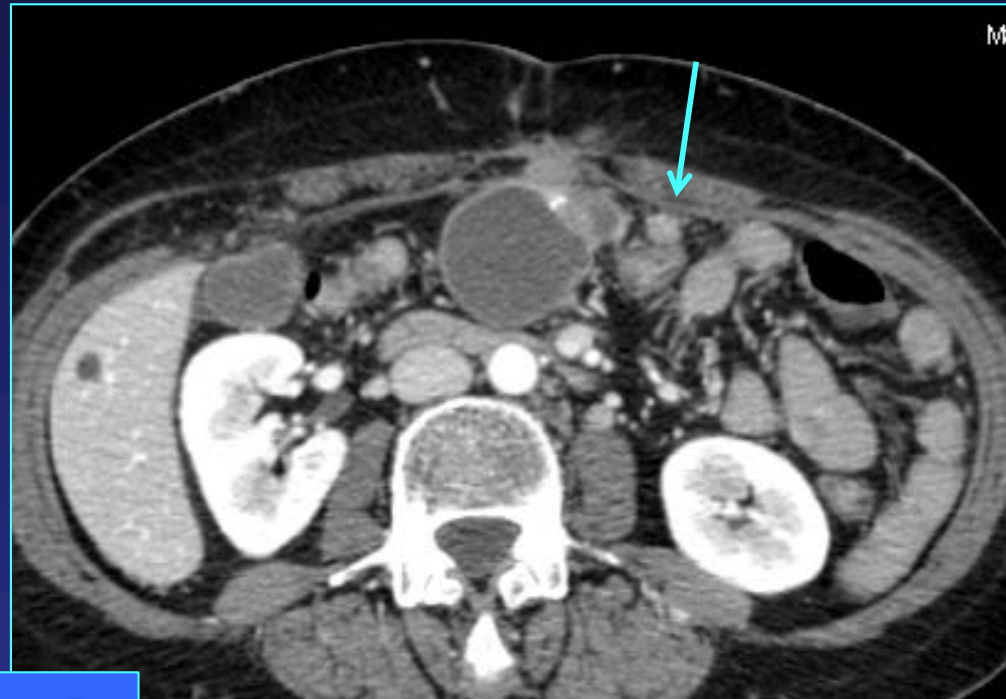
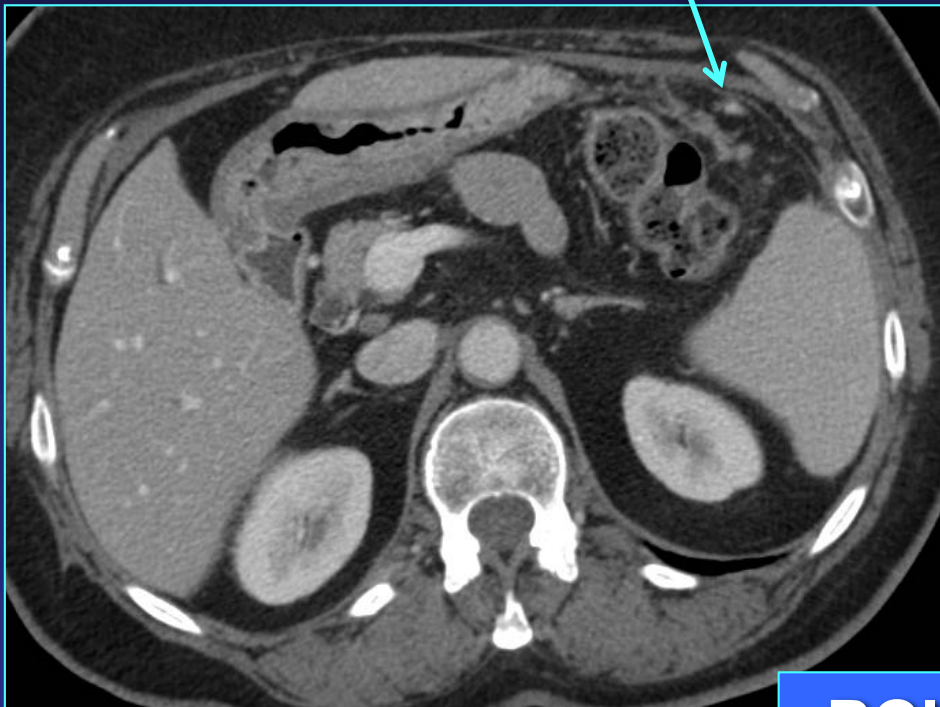
Morton A. Meyers, Editor-in-Chief

## Accuracy of MDCT in the preoperative definition of Peritoneal Cancer Index (PCI) in patients with advanced ovarian cancer who underwent peritonectomy and hyperthermic intraperitoneal chemotherapy (HIPEC)

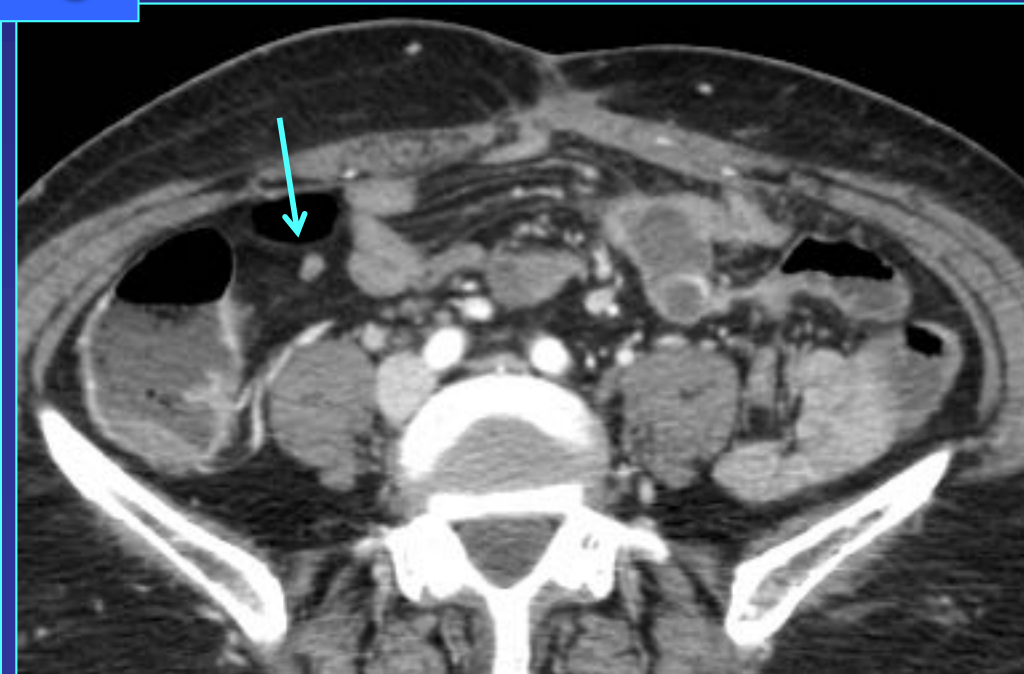
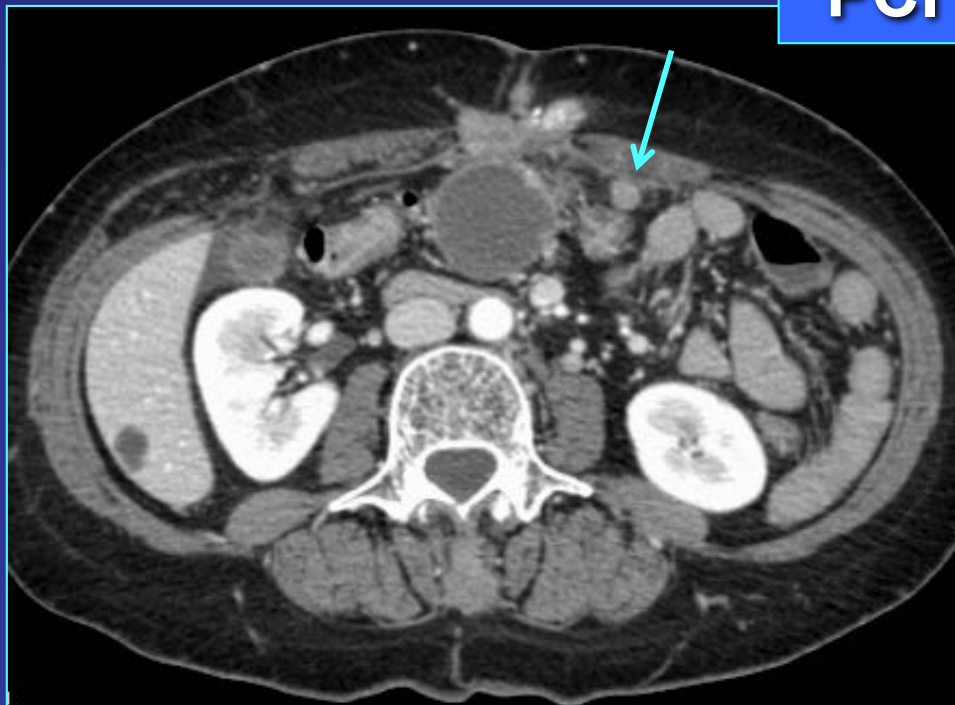
Maria Antonietta Mazzei,<sup>1</sup> Leila Khader,<sup>1</sup> Alfredo Cirigliano,<sup>1</sup> Nevada Cioffi Squitieri,<sup>1</sup> Susanna Guerrini,<sup>1</sup> Beatrice Forzoni,<sup>1</sup> Daniele Marrelli,<sup>2</sup> Franco Roviello,<sup>2</sup> Francesco Giuseppe Mazzei,<sup>3</sup> Luca Volterrani<sup>1</sup>

**Table 2.** The diagnostic results of CT versus histology, at the patient-level analysis

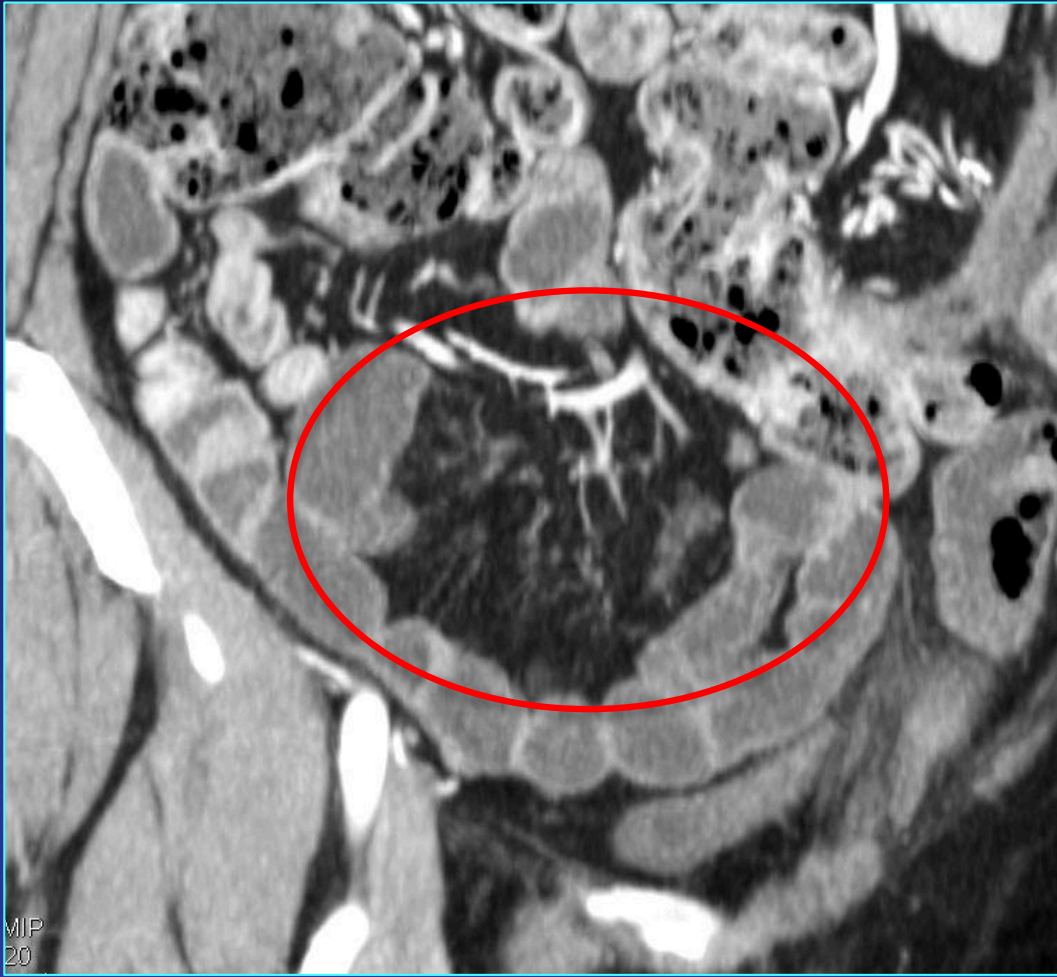
	TP	FP	TN	FN	SENS (%)	SPEC (%)	PPV (%)	NPV (%)	ACC (%)
Overall	38	3	2	0	100	40	93	100	93
Region 0–8 <sup>a</sup>	38	3	2	0	100	40	93	100	93
Region 9–12 <sup>b</sup>	7	4	27	5	58	87	64	84	79



PCI = 8







# PEG<sup>1</sup> + vs PEG -

**RESULTS**

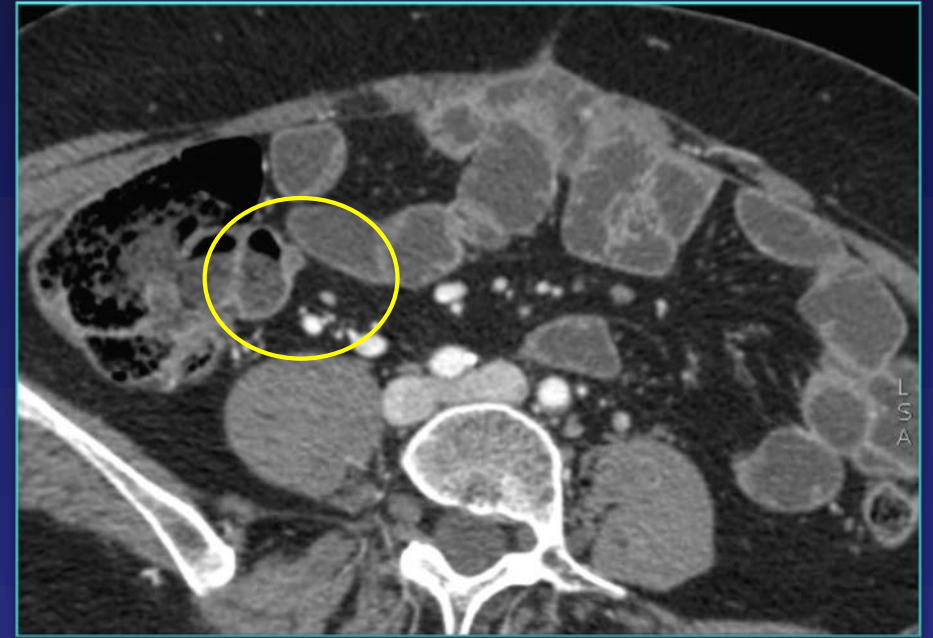
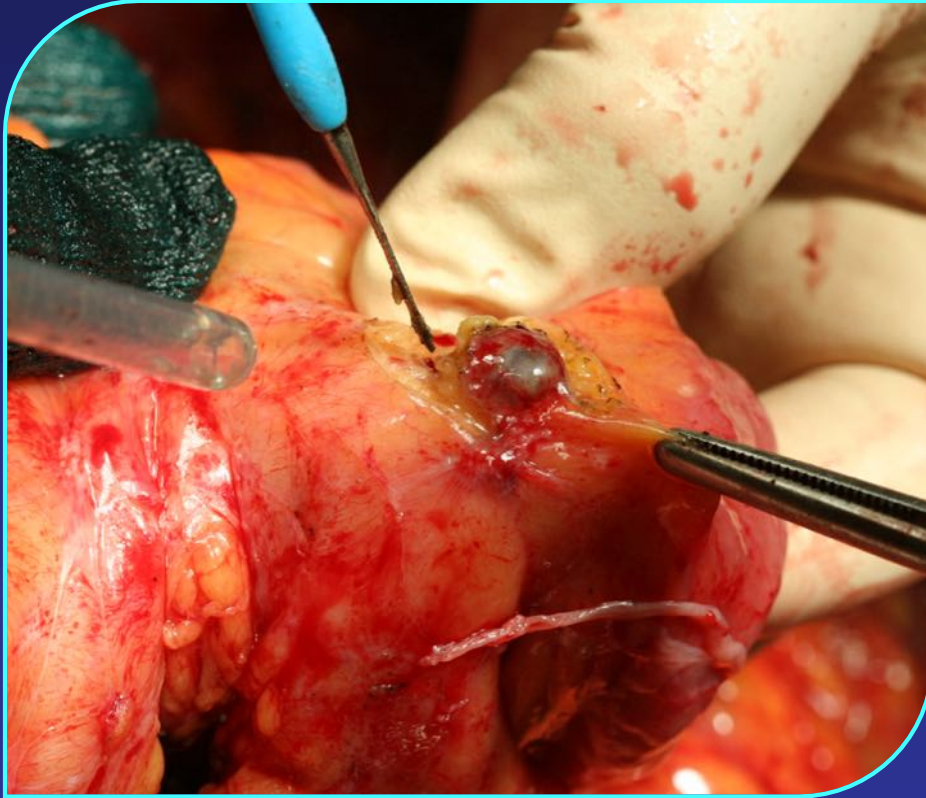
**Regioni 9-12**

**PATIENT-LEVEL ANALYSIS CT vs HISTOLOGY (patients)**

	<b>TP</b>	<b>FP</b>	<b>TN</b>	<b>FN</b>	<b>Sensitivity</b>	<b>Specificity</b>	<b>PPV</b>	<b>NPV</b>	<b>Accuracy</b>
PEG + (13)	7	2	4	0	100%	67%	78%	100%	85%
PEG - (15)	6	2	4	3	67%	67%	75%	57%	67%

<sup>1</sup> Polyethylen glycol





## Stadiazione AJCC/UICC 2010 7th

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<b>Stadio 0</b>	Tis N0 M0
<b>Stadio IA</b>	T1 N0 M0
<b>Stadio IB</b>	T2 N0 M0 T1 N1 M0
<b>Stadio IIA</b>	T3 N0 M0 T2 N1 M0 T1 N2 M0
<b>Stadio IIB</b>	T4a N0 M0 T3 N1 M0 T2 N2 M0 T1 N3 M0
<b>Stadio IIIA</b>	T4a N1 M0 T3 N2 M0 T2 N3 M0
<b>Stadio IIIB</b>	T4b N0-1 M0 T4a N2 M0 T3 N3 M0
<b>Stadio IIIC</b>	T4a N3 M0 T4b N2-3 M0
<b>Stadio IV</b>	ogni T ogni N M1



## **cTNM Classification of stomach tumours (UICC 8<sup>th</sup> edition)**

### **NEW: Clinical Stage**

Stage I	T1, T2	N0	M0
Stage IIA	T1, T2	N1, N2, N3	M0
Stage IIB	T3, T4a	N0	M0
Stage III	T3, T4a	N1, N2, N3	M0
Stage IVA	T4b	Any N	M0
Stage IVB	Any T	Any N	M1

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## 8th

**Stage IIA T1, T2 N1, N2, N3 M0**

**Stage IIB T3, T4a N0 M0**

**Stage III T3, T4a N1, N2, N3 M0**

**Stage IVA T4b Any N M0**

**Stage IVB Any T Any N M1**

## 7th

<b>Stadio IIA</b>	T3 N0 M0 T2 N1 M0 T1 N2 M0
<b>Stadio IIB</b>	T4a N0 M0 T3 N1 M0 T2 N2 M0 T1 N3 M0

<b>Stadio IIIA</b>	T4a N1 M0 T3 N2 M0 T2 N3 M0
<b>Stadio IIIB</b>	T4b N0-1 M0 T4a N2 M0 T3 N3 M0
<b>Stadio IIIC</b>	T4a N3 M0 T4b N2-3 M0

<b>Stadio IV</b>	ogni T ogni N M1
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Tis	N0	M0	0
T1	N0	M0	I
T2	N0	M0	I
T1	N1, N2, or N3	M0	IIA
T2	N1, N2, or N3	M0	IIA
T3	N0	M0	IIB
T4a	N0	M0	IIB
T3	N1, N2, or N3	M0	III
T4a	N1, N2, or N3	M0	III
T4b	Any N	M0	IVA
Any T	Any N	M1	IVB

**ypTNM**

**cTNM**

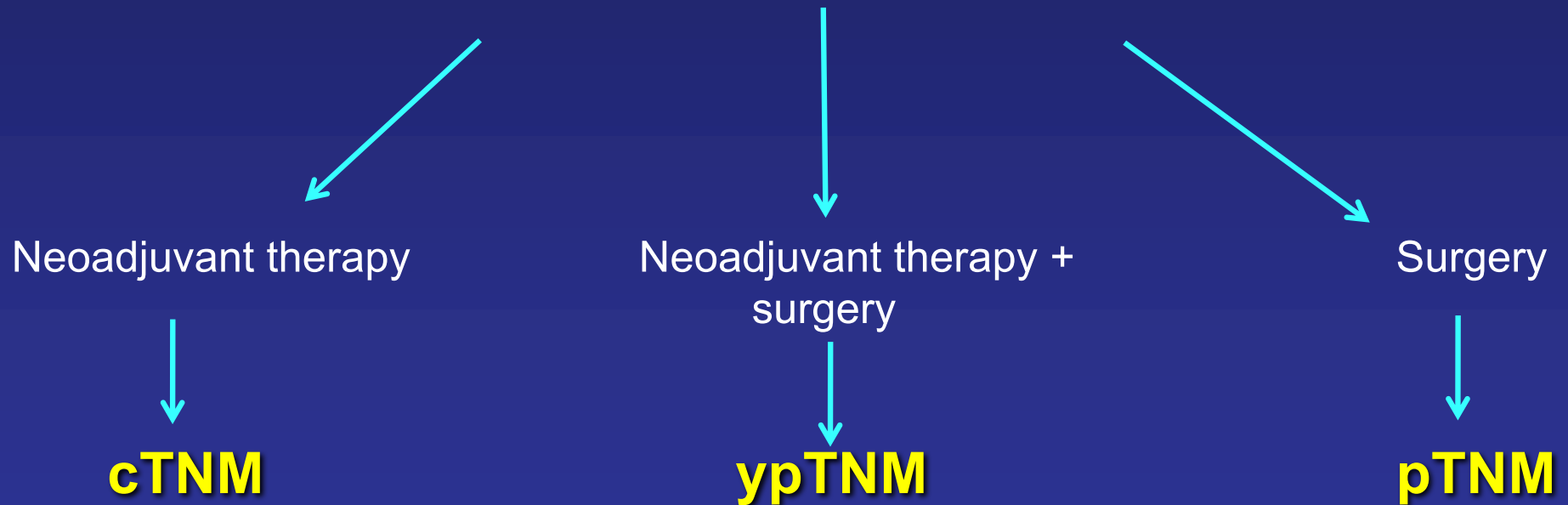
**pTNM**

T1	N0	M0	I
T2	N0	M0	I
T1	N1	M0	I
T3	N0	M0	II
T2	N1	M0	II
T1	N2	M0	II
T4a	N0	M0	II
T3	N1	M0	II
T2	N2	M0	II
T1	N3	M0	II
T4a	N1	M0	III
T3	N2	M0	III
T2	N3	M0	III
T4b	N0	M0	III
T4b	N1	M0	III
T4a	N2	M0	III
T3	N3	M0	III
T4b	N2	M0	III
T4b	N3	M0	III
T4a	N3	M0	III
Any T	Any N	M1	IV

Tis	N0	M0	0
T1	N0	M0	IA
T1	N1	M0	IB
T2	N0	M0	IB
T1	N2	M0	IIA
T2	N1	M0	IIA
T3	N0	M0	IIA
T1	N3a	M0	IIB
T2	N2	M0	IIB
T3	N1	M0	IIB
T4a	N0	M0	IIB
T2	N3a	M0	IIIA
T3	N2	M0	IIIA
T4a	N1	M0	IIIA
T4a	N2	M0	IIIA
T4b	N0	M0	IIIA
T1	N3b	M0	IIIB
T2	N3b	M0	IIIB

# TNM Classification of stomach tumours (UICC 8<sup>th</sup> edition)

## cTNM (Clinical Stage)



Clinical stage

**AJCC y stage**

Pathological stage



# Anatomia patologica: Lauren

## **DIFFUSO / MISTO** (circa 35%)

*Diffusione sottomucosa (linite plastica)*

*Micro: cellule rotonde che invadono individualmente la parete gastrica (assenza di coesione)*

*NO molecole intracellulari di adesione: metastasi precoci*

## **INTESTINALE** (circa 65%)

*cellule neoplastiche connesse tra loro ( $\beta$ -catenina ed E-caderina) formano tubuli e ghiandole come la mucosa intestinale normale*

## Different Patterns of Recurrence in Gastric Cancer Depending on Lauren's Histological Type: Longitudinal Study

Daniele Marrelli, M.D.,<sup>1</sup> Franco Roviello, M.D.,<sup>1</sup> Giovanni de Manzoni, M.D.,<sup>2</sup> Paolo Morgagni, M.D.,<sup>3</sup> Alberto Di Leo, M.D.,<sup>2</sup> Luca Saragoni, M.D.,<sup>4</sup> Alfonso De Stefano, M.D.,<sup>1</sup> Secondo Folli, M.D.,<sup>3</sup> Claudio Cordiano, M.D.,<sup>2</sup> Enrico Pinto, M.D.,<sup>1</sup> for the Italian Research Group for Gastric Cancer<sup>5</sup>

<sup>1</sup>Chirurgia Oncologica, University of Siena, Policlinico Le Scotte, Viale Bracci, 53100 Siena, Italy

<sup>2</sup>Istituto di Semeiotica Chirurgica, University of Verona, Borgotrento Hospital, Piazza Stefani 1, 37126 Verona, Italy

<sup>3</sup>Divisione di Chirurgia I, "Morgagni" Hospital of Forlì, Piazzale le Sueri 1, 47100 Forlì, Italy

<sup>4</sup>Servizio di Anatomia Patologica, "Pierantoni" Hospital of Forlì, Via Forlanini 34, 47100 Forlì, Italy

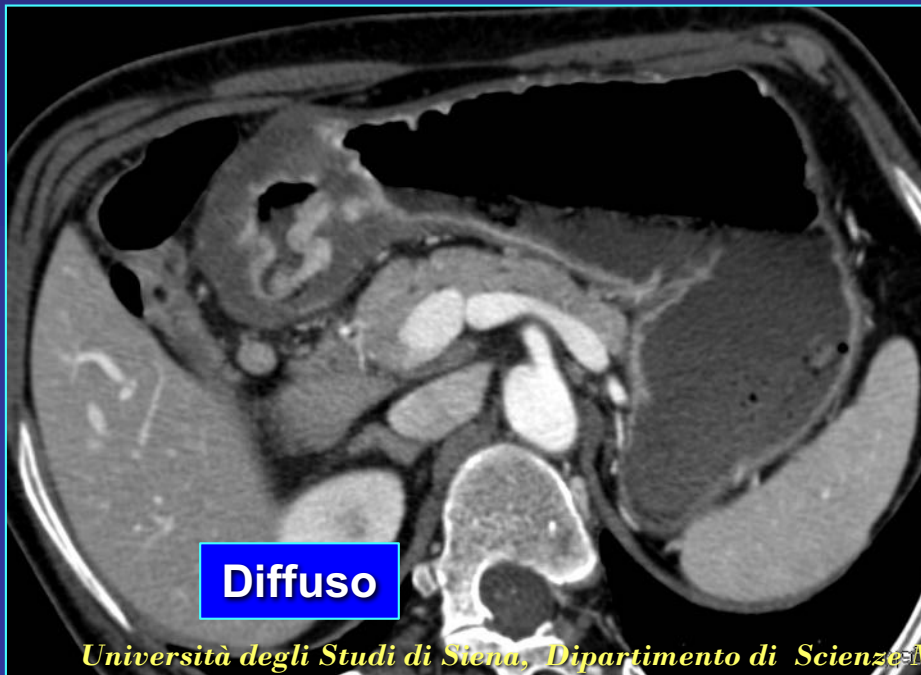
<sup>5</sup>Secretary IRGGC at Semeiotica Chirurgica, Borgotrento Hospital, Piazza Stefani 1, 37126 Verona, Italy

World J. Surg. 2002

## Gruppo Italiano Ricerca Cancro Gastrico (GIRCG)

Table 1. Sites of recurrence in the intestinal and diffuse types of gastric carcinoma.

Type of recurrence	Lauren histotype <sup>a</sup>		p value
	Intestinal (n = 273)	Diffuse (n = 139)	
Locoregional	54 (20)	37 (27)	0.1173
Hematogenous	51 (19)	22 (16)	0.4699
Peritoneal	25 (9)	47 (34)	< 0.0001





# Metodologia TC

## Distensione e ipotonizzazione

Valutare bene le aree infiltrate (non si distendono)

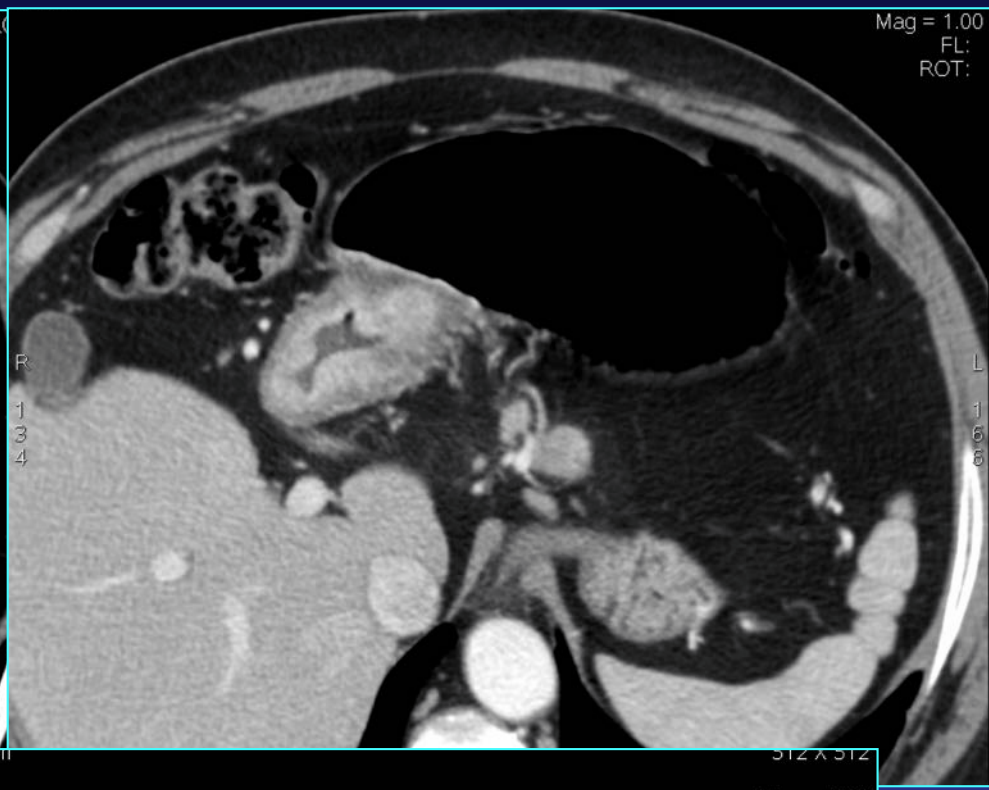
Migliorare la visibilità del T

Migliorare il contrasto T / parete

**Aria o acqua?**

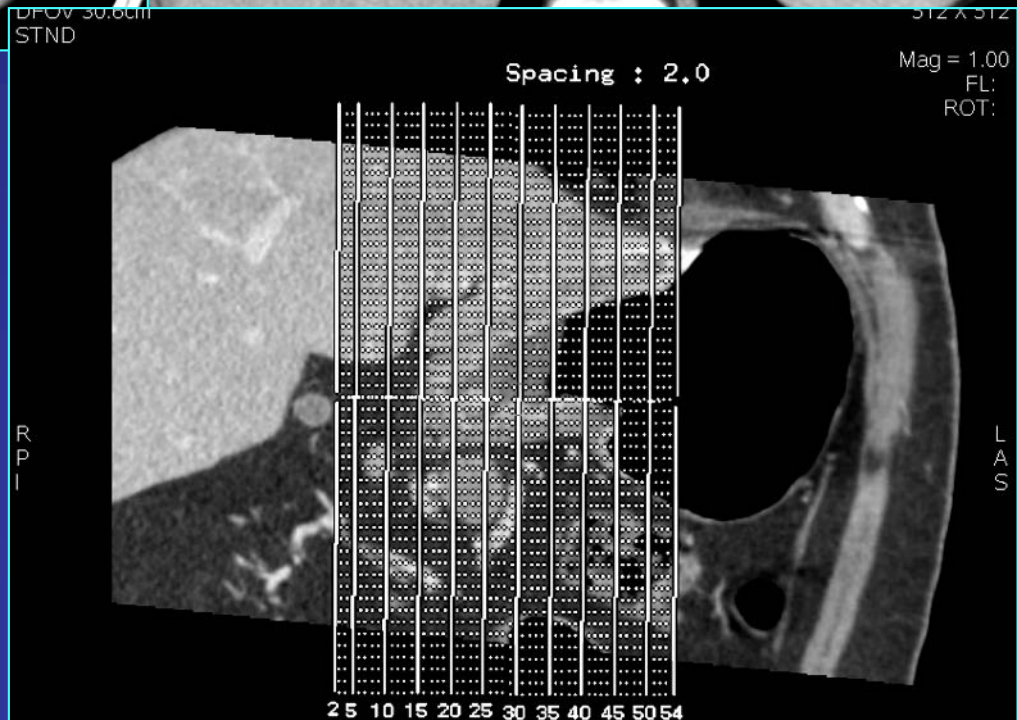
**Aria migliore nei Tm poco vascularizzati**

**SS < 2,5 mm. RI minore del 50% dello ss mdc  
(fase portale precoce 50' circa)**



## **RICOSTRUZIONI !**

**Lo spessore e l'orientamento spaziale sono decisi dal Radiologo in base alle necessità diagnostiche del singolo caso.**



# TCMS: stomaco

AJCC 2<sup>nd</sup> ed. 2002

STAGING

autore	n° pz	tecnica	accuratezza T
<b>STABILE IANORA</b> <i>Rad. Med. 2003</i>	27	H <sub>2</sub> O, no ipot. farm. 2.5mm/1mm i.r. add.sup. 35s addome completo 70s	88,9%
<b>HABERMAN CR</b> <i>Radiology 2004</i>	34	H <sub>2</sub> O, ipot. farm. 3mm/3mm i.r. add.sup. 35s addome completo 70s	76%
<b>MARCELLI et al</b> <i>RSNA 2003</i>	40	H <sub>2</sub> O, ipot. farm. 1.25mm/1mm i.r. add.sup. pelvi 2.5/5mm i.r.	77,5%

autore	n° pz	tecnica	accuratezza T
<b>VOLTERRANI</b> <i>ECR 2005</i>	54	aria, ipot. farm. 2.5mm/0.8mm i.r. add.comp. 55s	81.5%

(TC 4 e 16 s.)

JCGC 2<sup>nd</sup> ed.



## Gastric cancer: Imaging and staging with MDCT based on the 7th AJCC guidelines

Mi Hee Lee, Dongil Choi, Min Jung Park, Min Woo Lee

Abdom Imaging (2012) 37:531–540  
DOI: 10.1007/s00261-011-9780-3

In the CT images demonstrating mural invasion of cancer in the gastric wall according to the 7th AJCC, T1a (Fig. 1) has a tendency not to be visualized on 2D CT images, and T1b frequently shows mucosal thickening with enhancement. In the differential point between T1b and T2 on CT images, T1b demonstrates a low-attenuation stripe at the base of the lesion corresponding to the submucosal layer, while T2 demonstrates a thickened gastric wall with loss or disruption of a low-attenuation stripe, but a clear and smooth outer gastric surface around the lesion [29] (Fig. 2). Previous CT criteria of T3 tumors have included nodular or irregular outer borders of the thickened gastric wall or perigastric fat infiltration [30]. Based on the new 7th AJCC T staging of gastric cancer, the differentiation of T3 and T4a on CT images is very difficult because the serosa of the gastric wall is not visible on CT images and subserosal adipose tissue is different from person-to-person (Figs. 3 and 4). In addition, the differentiation of perigastric infiltration from gastric cancer and perigastric inflammation or fibrosis on CT images can be difficult thus T2 tumors could be over-staged as T3 tumors or T4 tumors [30] (Fig. 5). Direct extension and invasion of tumor into a contiguous organ or structure on CT images is diagnosed as a T4b tumor.

# Diagnostic performance of 64-section CT using CT gastrography in preoperative T staging of gastric cancer according to 7th edition of AJCC cancer staging manual

Jin Woong Kim · Sang Soo Shin · Suk Hee Heo · Yoo Duk Choi · Hyo Soon Lim · Young Kyu Park · Chang Hwan Park · Yong Yeon Jeong · Heoung Keun Kang

Eur Radiol (2012) 22:654–662  
DOI 10.1007/s00330-011-2283-3

**Table 3** Diagnostic accuracy of 64-section CT for tumour staging

MDCT stage	Pathological stage <sup>a</sup>					Accuracy (%)	Sensitivity (%)	Specificity (%)
	pT1a (n=43)	pT1b(n=33)	pT2(n=16)	pT3(n=15)	pT4a(n=20)			
Reviewer 1								
T1a	40	8	0	0	0	91.3	93.0	90.5
T1b	2	23	0	0	0	90.6	69.7	97.9
T2	1	2	10	1	3	89.8	62.5	93.7
T3	0	0	5	10	2	90.6	66.7	93.8
T4a	0	0	1	4	15	92.1	75.0	95.3
Reviewer 2								
T1a	39	5	0	0	0	92.9	90.7	94.1
T1b	4	27	0	0	0	92.1	81.8	95.8
T2	0	1	11	0	2	93.7	68.8	97.3
T3	0	0	5	11	1	92.1	73.3	94.6
T4a	0	0	0	4	17	94.5	85.0	96.3

<sup>a</sup>Data are numbers of gastric cancers

The overall accuracy of the T staging was 77.2% (98/127) for reviewer 1 and 82.7% (105/127) for reviewer 2

# Problemi del T in TC

*mancata differenziazione tra T1a e T1b*

*mancata differenziazione tra T1b e T2*

*mancata differenziazione tra T3 e T4a*

***CUI PRODEST ???***

***Solo per mucosectomia >  
econdoscopia***

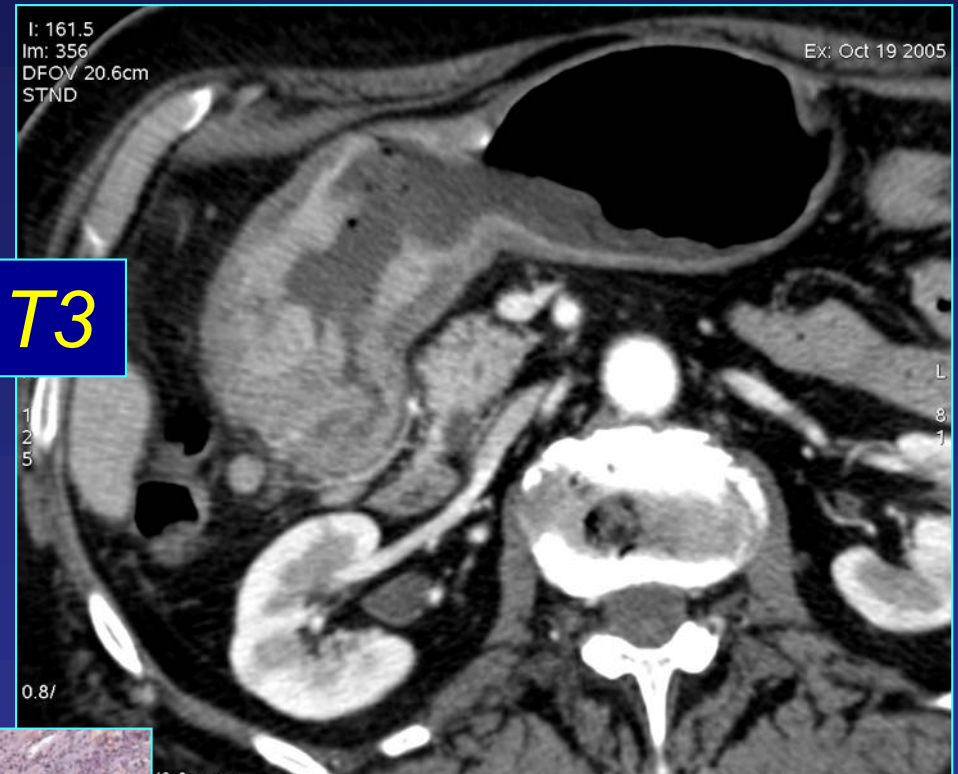
***Mancata differenziazione T2 / T3 !!***



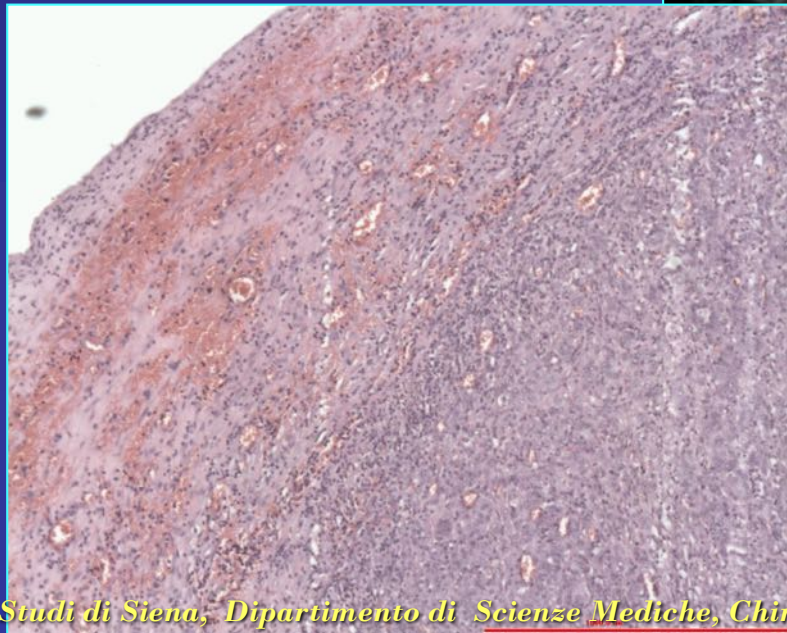
*Tumoral infiltration into the gastric wall could be accompanied by inflammatory or edematous change beneath the cancer*



**TC T3**

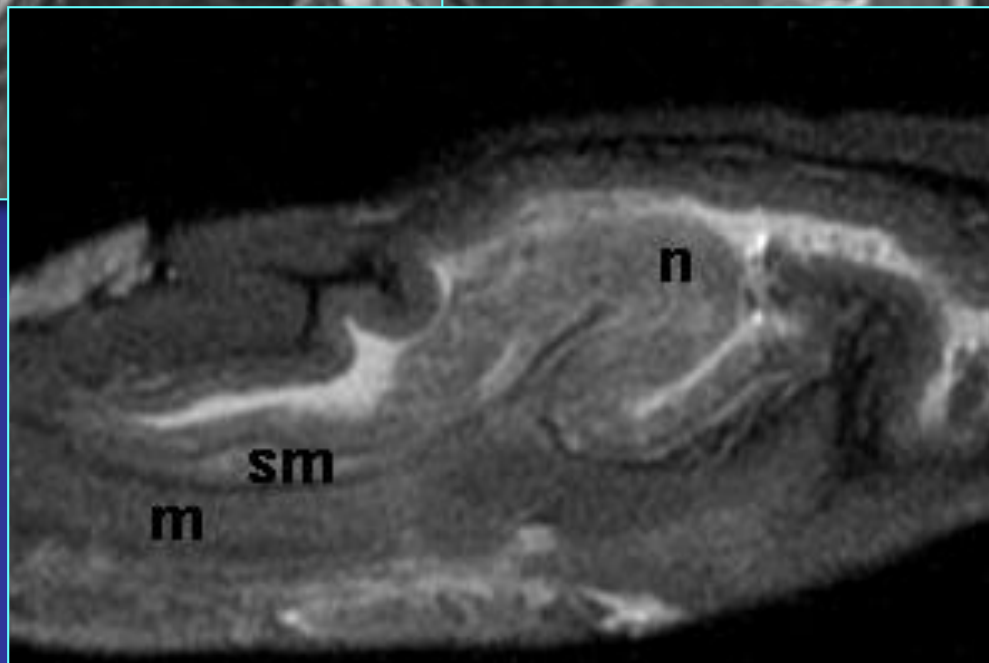
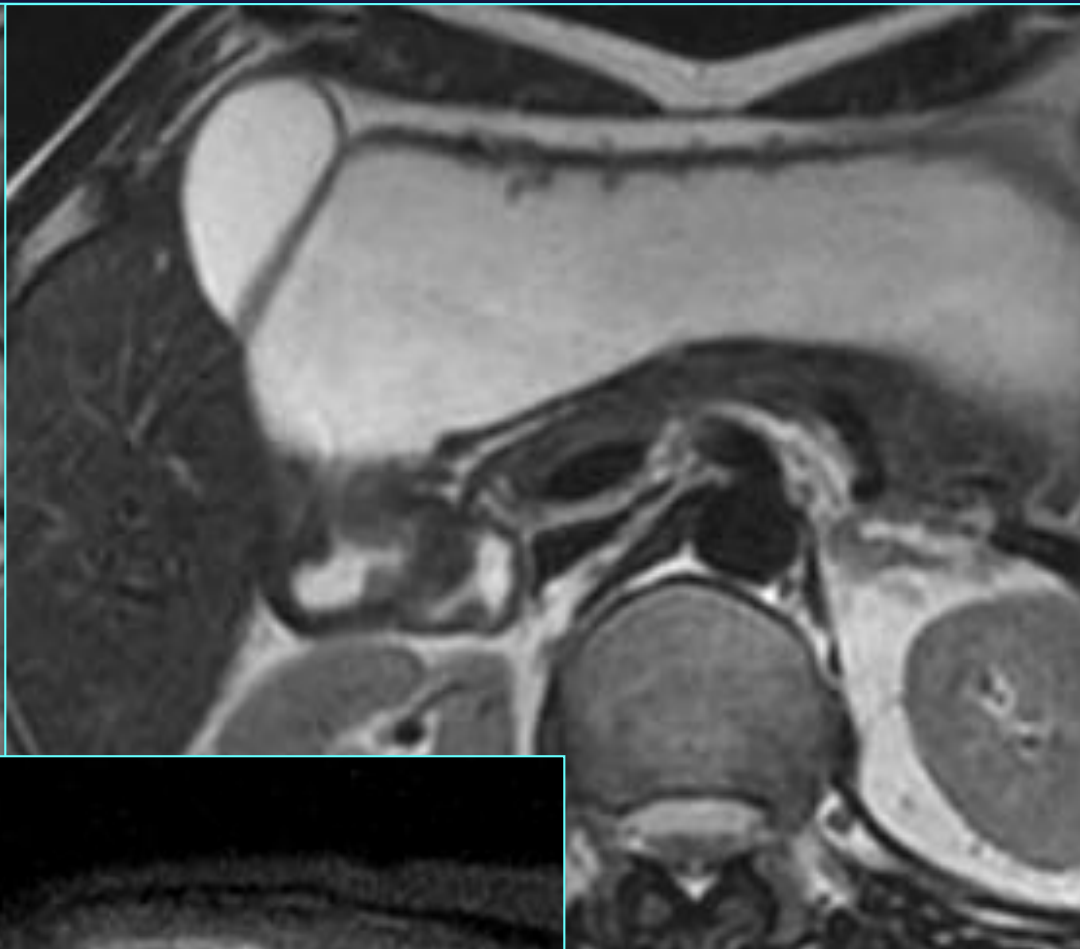
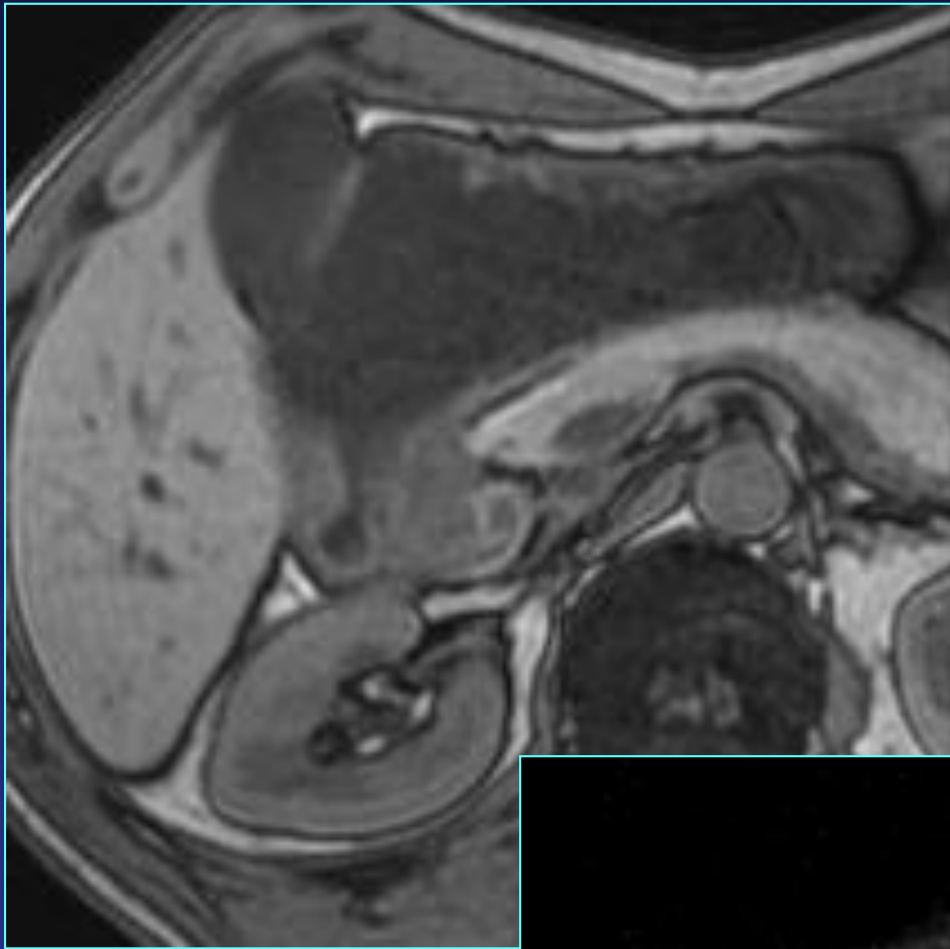


**pT2**



**Neoadiuvante non necessaria**

Courtesy Dr. Vindigni



pT1

# RM: stomaco

## STAGING

autore	N° pz	Accuratezza T	Accuratezza N
Acrocena et al. 2003	17	53 %	50 %
Tatsumi et al. 2006 <b>uspio</b>	17		<b>94.8 %</b>
Tokouhara et al. 2008 <b>uspio</b>	31		<b>97.1</b>
Kwee meta an. 2007		71,4 > 81.6 %	
Anzidei et al. 2009	40	80 %	
Volterrani (dati non p.) 2006	18	83.4 %	58.6 %





pT2N0

Radiol Med. 2009 Oct;114(7):1065-79. doi: 10.1007/s11547-009-0455-x. Epub 2009 Sep 22.

## Diagnostic performance of 64-MDCT and 1.5-T MRI with high-resolution sequences in the T staging of gastric cancer: a comparative analysis with histopathology.

Anzidei M, Napoli A, Zaccagna F, Di Paolo P, Zini C, Cavallo Marincola B, Geiger D, Catalano C, Passariello R.

### Abstract

**PURPOSE:** This study was undertaken to compare the accuracy of magnetic resonance (MR) imaging and 64-slice multidetector computed tomography (64-MDCT) in the T staging of gastric carcinoma in comparison with histopathology.

**MATERIALS AND METHODS:** Forty patients with an endoscopic diagnosis of gastric carcinoma underwent preoperative MR imaging and 64-MDCT, both of which were performed after i.v. injection of scopolamine and water distension of the stomach. In the MR imaging protocol, we acquired T2-weighted turbo spin-echo (TSE) sequences, true fast imaging steady-state free precession (true-FISP) and gadolinium-enhanced T1-weighted volumetric interpolated breath-hold examination (VIBE) 3D sequences. Contrast-enhanced CT scans were obtained in the arterial and venous phases. Two groups of radiologists independently reviewed the MR and 64-MDCT images. The results were compared with pathology findings.

**RESULTS:** In the evaluation of T stage, 64-MDCT had 82.5% and MR imaging had 80% sensitivity. Accuracy of MR imaging was slightly higher than that of 64-MDCT in identifying T1 lesions (50% vs 37.5%), whereas the accuracy of 64-MDCT was higher in differentiating T2 lesions (81.2% vs 68.7%). The accuracy of MR imaging and 64-MDCT did not differ significantly in the evaluation of T3-T4 lesions ( $p>0.05$ ). Understaging was observed in 20% of cases with MR imaging and in 17.5% with 64-MDCT.

**CONCLUSIONS:** MR imaging and 64-MDCT accuracy levels did not differ in advanced stages of disease, whereas MR imaging was superior in identifying early stages of gastric cancer and can be considered a valid alternative to MDCT in clinical practice.



## Preoperative locoregional staging of gastric cancer: is there a place for magnetic resonance imaging? Prospective comparison with EUS and multidetector computed tomography.

Giganti F<sup>1</sup>, Orsenigo E, Arcidiacono PG, Nicoletti R, Albarello L, Ambrosi A, Salerno A, Esposito A, Petrone MC, Chiari D, Staudacher C, Del Maschio A, De Cobelli F.

### ⊕ Author information

#### Abstract

**BACKGROUND:** The aim of this study was to prospectively compare the diagnostic performance of magnetic resonance imaging (MRI), multidetector computed tomography (MDCT) and endoscopic ultrasonography (EUS) in the preoperative locoregional staging of gastric cancer.

**METHODS:** This study had Institutional Review Board approval, and informed consent was obtained from all patients. Fifty-two patients with biopsy-proven gastric cancer underwent preoperative 1.5-T MRI, 64-channel MDCT and EUS. All images were analysed blind, and the results were compared with histopathological findings according to the seventh edition of the TNM classification. After the population had been divided on the basis of the local invasion (T1-3 vs T4a-b) and nodal involvement (N0 vs N+), sensitivity, specificity, positive and negative predictive value, and accuracy were calculated and diagnostic performance measures were assessed using the McNemar test.

**RESULTS:** For T staging, EUS showed higher sensitivity (94 %) than MDCT and MRI (65 and 76 %;  $p = 0.02$  and  $p = 0.08$ ). MDCT and MRI had significantly higher specificity (91 and 89 %) than EUS (60 %) ( $p = 0.0009$  and  $p = 0.003$ ). Adding MRI to MDCT or EUS did not result in significant differences for sensitivity. For N staging, EUS showed higher sensitivity (92 %) than MRI and MDCT (69 and 73 %;  $p = 0.01$  and  $p = 0.02$ ). MDCT showed better specificity (81 %) than EUS and MRI (58 and 73 %;  $p = 0.03$  and  $p = 0.15$ ).

**CONCLUSIONS:** Our prospective study confirmed the leading role of EUS and MDCT in the staging of gastric cancer and did not prove, at present, the value of the clinical use of MRI.



## Diametro massimo del tumore nel carcinoma gastrico

*Fattore prognostico o rilevante parametro clinico?*

*Chirurgia Italiana 2008*

## Tumor Diameter as a Prognostic Factor in Patients with Gastric Cancer

Chikara Kunisaki, MD, PhD,<sup>1</sup> Hirochika Makino, MD, PhD,<sup>1</sup> Ryo Takagawa, MD,<sup>1</sup> Takashi Oshima, MD, PhD,<sup>1</sup> Yasuhiko Nagano, MD, PhD,<sup>1</sup> Takashi Kosaka, MD,<sup>2</sup> Hidetaka A. Ono, MD, PhD,<sup>2</sup> Yuichi Otsuka, MD, PhD,<sup>2</sup> Hirotohi Akiyama, MD, PhD,<sup>2</sup> Yasushi Ichikawa, MD, PhD,<sup>2</sup> and Hiroshi Shimada, MD, PhD<sup>2</sup>

*Annals of Surgical Oncology 2008*

**Table 4 Survival based on pT and pN stages in the large-sized tumor and small-sized tumor groups**

	<i>n</i> (5-yr OS, %)		$\chi^2$	<i>P</i> value
	LST	SST		
pT2				
pN0	9 (88.9)	36 (96.7)	0.260	0.610
pN1	11 (72.7)	26 (91.1)	0.000	0.986
pN2	4 (50.0)	16 (87.1)	0.066	0.797
pN3	4 (0.00)	11 (63.6)	7.661	0.006
pT3				
pN0	3 (66.7)	9 (100.0)	1.634	0.201
pN1	6 (66.7)	4 (75.0)	0.348	0.555
pN2	2 (0.0)	3 (66.7)	0.825	0.364
pN3	8 (12.5)	5 (40.0)	3.940	0.047
pT4a				
pN0	23 (68.7)	25 (83.1)	5.108	0.024
pN1	24 (54.2)	21 (75.4)	4.743	0.029
pN2	46 (27.2)	23 (61.9)	7.682	0.006
pN3	83 (6.9)	28 (48.6)	23.138	0.000

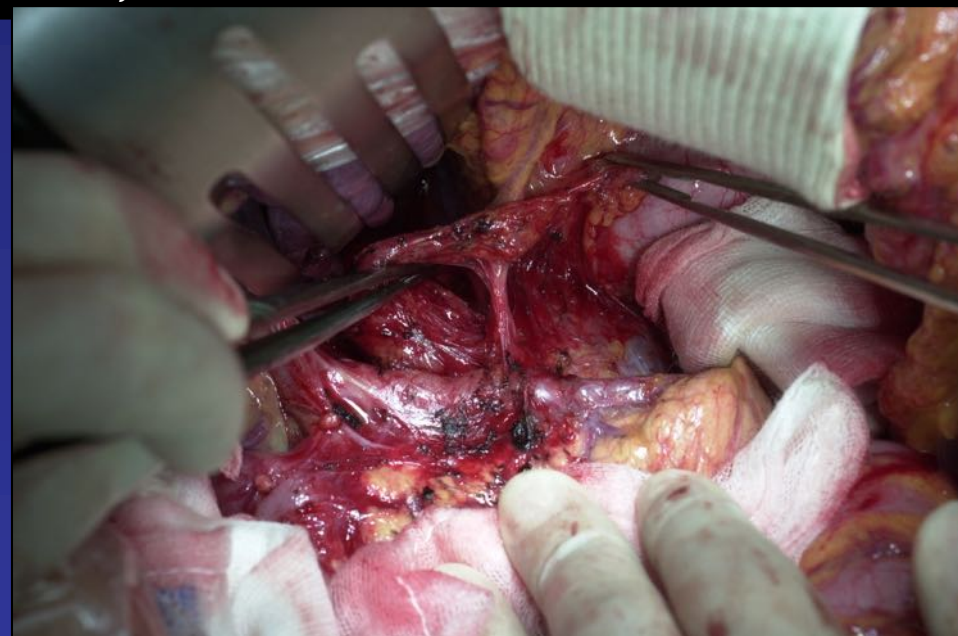
## Tumor size as a prognostic factor in patients with advanced gastric cancer in the lower third of the stomach

*Whang HM et al.  
WJG, 2012*

***The overall survival of SST is always higher than the same pT stage in LST***

*Accuracy of MDCT in preoperative definition of maximum tumour diameter in patients with gastric cancer*

***S Guerrini, A Parrinello, P Mercuri, C Vindigni, A Ginori, N Cioffi Squitieri, D Marrelli, FG Mazzei, MA Mazzei, L Volterrani***



# ACCURATEZZA D-MAX T1-2 vs T3-4 = 73% (104 pz)

**64 mm. (curve ROC)**

	<64mm	>64mm
T1a	11	0
T1b	7	1
T2	9	3
T3	8	8
T4a	15	33
T4b	1	8

**IL 92% DEI PAZIENTI CON D-MAX > 64 mm. PRESENTA UN T > T2**

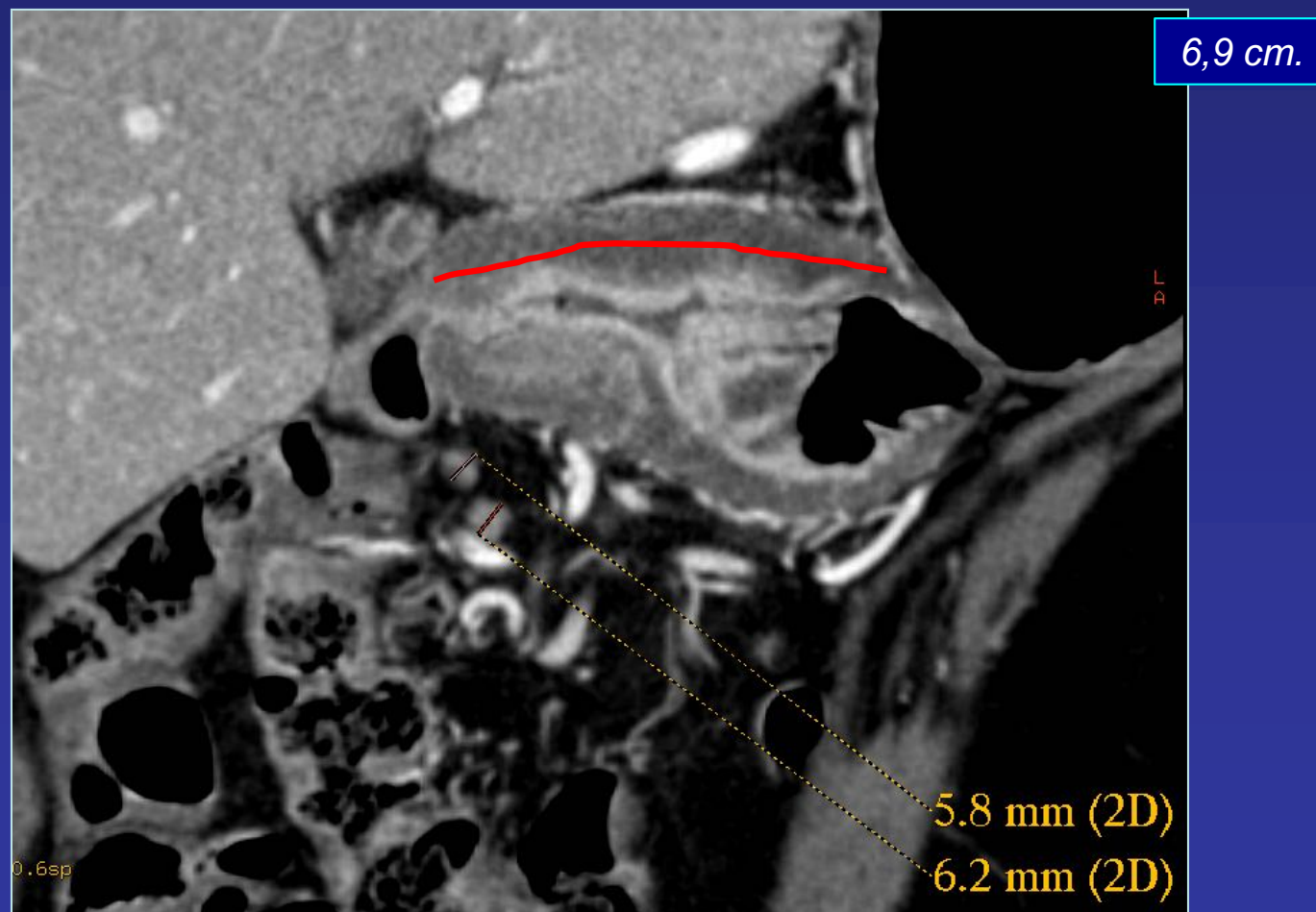


# Discrepancy with the correlation between DMAX AND T-STAGING



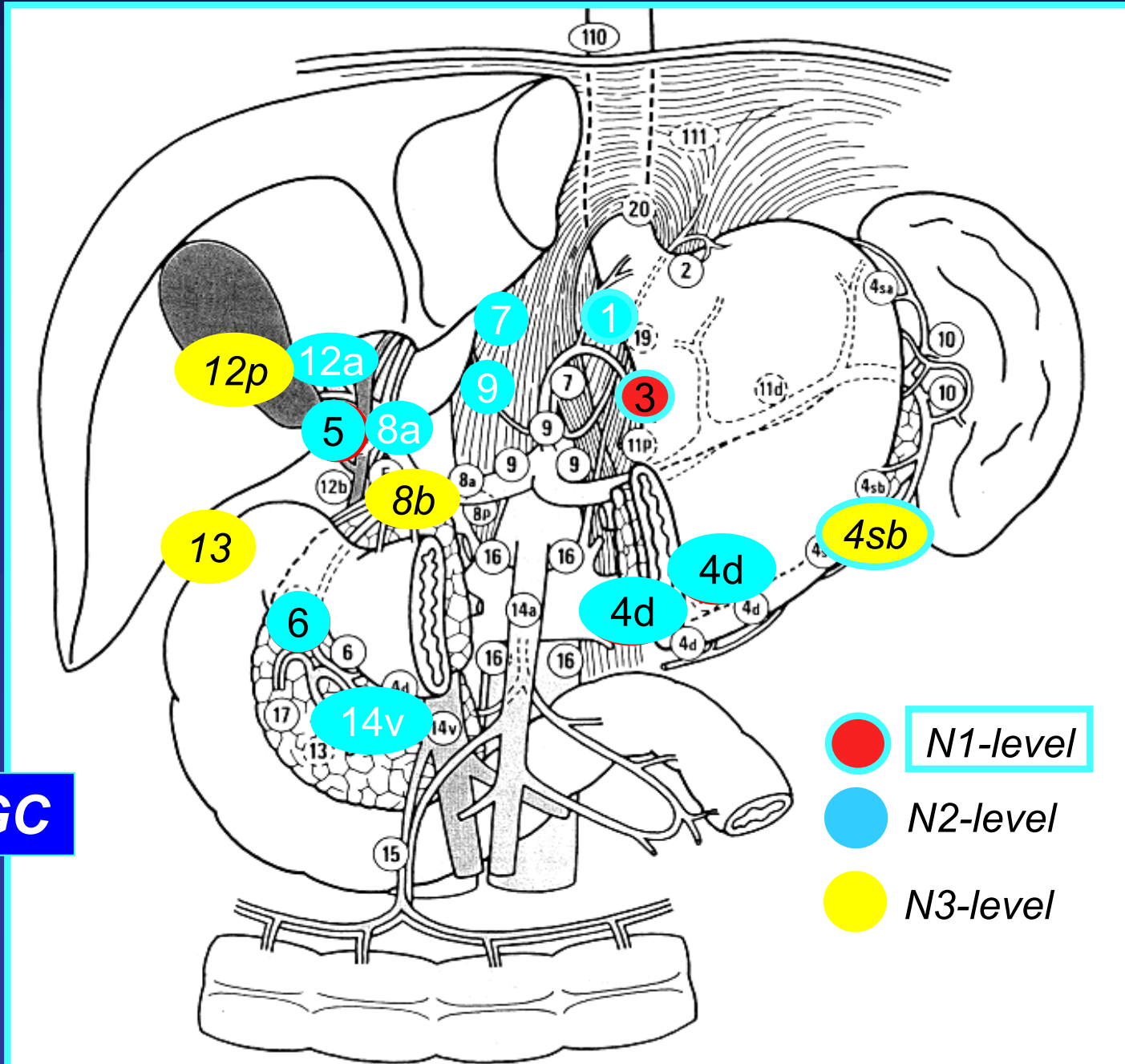
**Pathological data: Diffuse type, 64 mm, T1b**

**Il Dmax deve essere considerato, *sia pure ancora in modo del tutto sperimentale*, una possibilità aggiuntiva alla normale valutazione morfologica del T**



**TUMOR LOCATION: LOWER THIRD**

**TUMOR LOCATION: UPPER THIRD**



**2nd JCGC**



c) *Extent of lymph node metastasis (N)*

- N0 : No evidence of lymph node metastasis
- N1 : Metastasis to Group 1 lymph nodes, but no metastasis to Groups 2 or 3 lymph nodes
- N2 : Metastasis to Group 2 lymph nodes, but no metastasis to Group 3 lymph nodes
- N3 : Metastasis to Group 3 lymph nodes
- NX: Unknown

No. 1	Right paracardial LN
No. 2	Left paracardial LN
No. 3	LN along the lesser curvature
No. 4sa	LN along the short gastric vessels
No. 4sb	LN along the left gastroepiploic vessels
No. 4d	LN along the right gastroepiploic vessels
No. 5	Suprapyloric LN
No. 6	Infrapyloric LN
No. 7	LN along the left gastric artery
No. 8a	LN along the common hepatic artery (Anterosuperior group)
No. 8p	LN along the common hepatic artery (Posterior group)
No. 9	LN around the celiac artery
No. 10	LN at the splenic hilum
No. 11p	LN along the proximal splenic artery
No. 11d	LN along the distal splenic artery
No. 12a	LN in the hepatoduodenal ligament (along the hepatic artery)
No. 12b	LN in the hepatoduodenal ligament (along the bile duct)
No. 12p	LN in the hepatoduodenal ligament (behind the portal vein)
No. 13	LN on the posterior surface of the pancreatic head
No. 14v	LN along the superior mesenteric vein
No. 14a	LN along the superior mesenteric artery
No. 15	LN along the middle colic vessels
No. 16a1	LN in the aortic hiatus
No. 16a2	LN around the abdominal aorta (from the upper margin of the celiac trunk to the lower margin of the left renal vein)
No. 16b1	LN around the abdominal aorta (from the lower margin of the left renal vein to the upper margin of the inferior mesenteric artery)
No. 16b2	LN around the abdominal aorta (from the upper margin of the inferior mesenteric artery to the aortic bifurcation)
No. 17	LN on the anterior surface of the pancreatic head
No. 18	LN along the inferior margin of the pancreas
No. 19	Infradiaphragmatic LN
No. 20	LN in the esophageal hiatus of the diaphragm
No. 110	Paraesophageal LN in the lower thorax
No. 111	Supradiaphragmatic LN
No. 112	Posterior mediastinal LN

*Number-based system for N-staging*

**New**

2.2.2.1 *Lymph node metastasis (N)*

- NX: Regional lymph nodes cannot be assessed
- N0: No regional lymph node metastasis
- N1: Metastasis in 1–2 regional lymph nodes
- N2: Metastasis in 3–6 regional lymph nodes
- N3: Metastasis in 7 or more regional lymph nodes
  - N3a: Metastasis in 7–15 regional lymph nodes
  - N3b: Metastasis in 16 or more regional lymph nodes

Although it is not a prerequisite, the examination of 16 or more regional lymph nodes is recommended for N status determination.



## Proposal of a new stage grouping of gastric cancer for TNM classification: International Gastric Cancer Association staging project.

Sano T<sup>1</sup>, Coit DG<sup>2</sup>, Kim HH<sup>3</sup>, Roviello F<sup>4</sup>, Kassab P<sup>5</sup>, Wittekind C<sup>6</sup>, Yamamoto Y<sup>7</sup>, Ohashi Y<sup>7</sup>.

### + Author information

#### Abstract

**BACKGROUND:** The current AJCC staging system for gastric cancer (AJCC7) incorporated several major revisions to the previous edition. The T and N categories and the stage groups were newly defined, and adenocarcinoma of the esophagogastric junction (EGJ) was reclassified and staged according to the esophageal system. Studies to validate these changes showed inconsistent results. The International Gastric Cancer Association (IGCA) launched a project to support evidence-based revisions to the next edition of the AJCC staging system.

**METHODS:** Clinical and pathological data on patients who underwent curative gastrectomy at 59 institutions in 15 countries between 2000 and 2004 were retrospectively collected. Patients lost to follow-up within 5 years of surgery were excluded. Patients treated with neoadjuvant therapy were excluded. The data were analyzed in total, and separately by region of treatment.

**RESULTS:** Of 25,411 eligible cases, 84.8 % were submitted from 24 institutions of Japan and Korea, 6.4 % from other Asian countries, and 8.8 % from 29 Western institutions. The T and N categories of AJCC7 clearly stratified the patient survival. Patients with pN3a and pN3b showed distinct prognosis in all regions, and by introducing pN3a and pN3b into a cluster analysis, we established a new stage grouping with better stratification than AJCC7, especially among stage III subgroups. Survival of Siewert type 2 and 3 EGJ tumors was better stratified by this IGCA stage grouping than by either esophageal or gastric scheme of AJCC7.

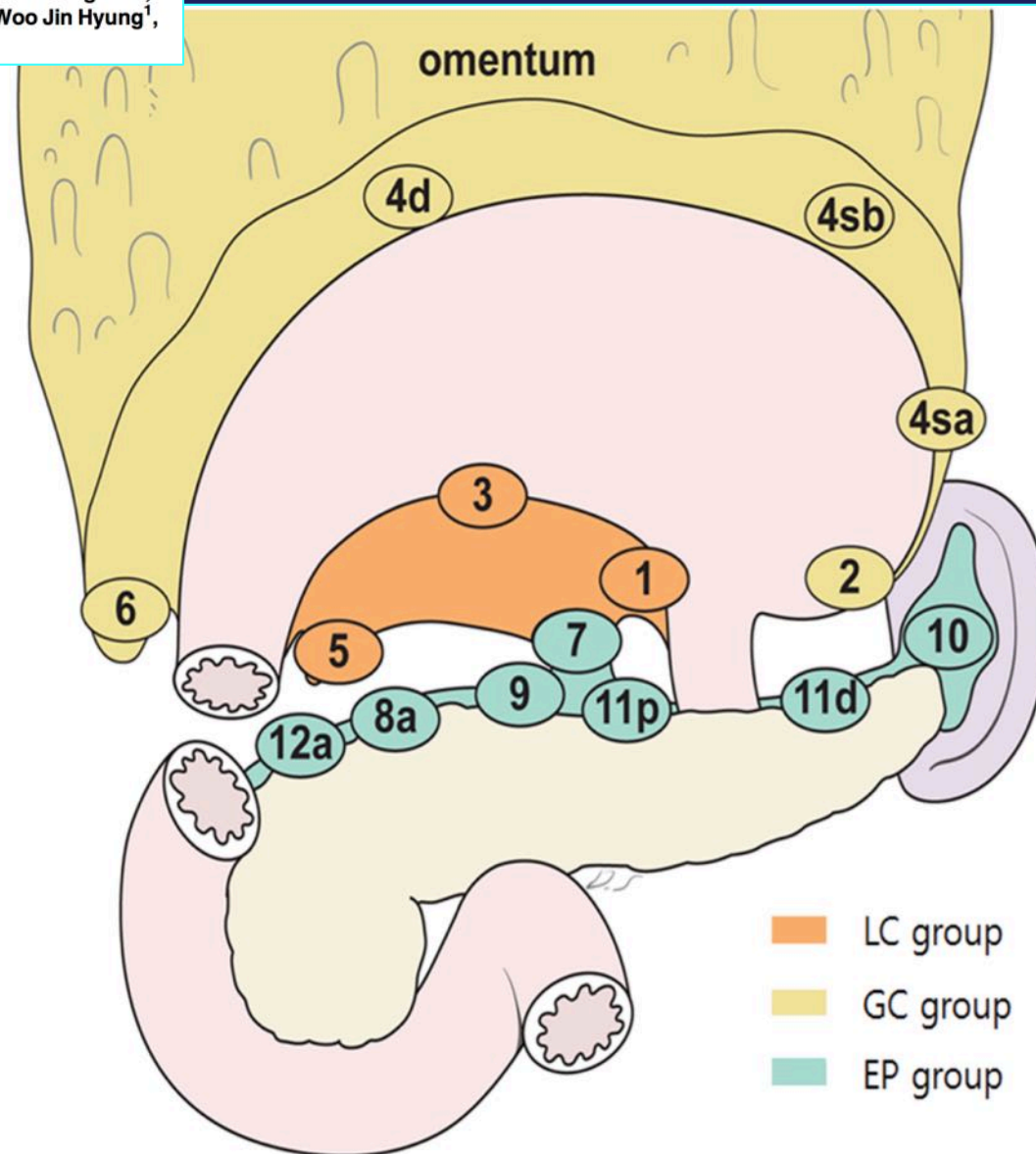
**CONCLUSIONS:** For the next revision of AJCC classification, we propose a new stage grouping based on a large, worldwide data collection.

# A Lymph Node Staging System for Gastric Cancer: A Hybrid Type Based on Topographic and Numeric Systems

Yoon Young Choi<sup>1,6†</sup>, Ji Yeong An<sup>1,6,6†</sup>, Hitoshi Katai<sup>4</sup>, Yasuyuki Seto<sup>5</sup>, Takeo Fukagawa<sup>4</sup>, Yasuhiro Okumura<sup>5</sup>, Dong Wook Kim<sup>3</sup>, Hyoung-Il Kim<sup>1</sup>, Jae-Ho Cheong<sup>1</sup>, Woo Jin Hyung<sup>1</sup>, Sung Hoon Noh<sup>1,2\*</sup>

**Table 2. Regional lymph nodes**

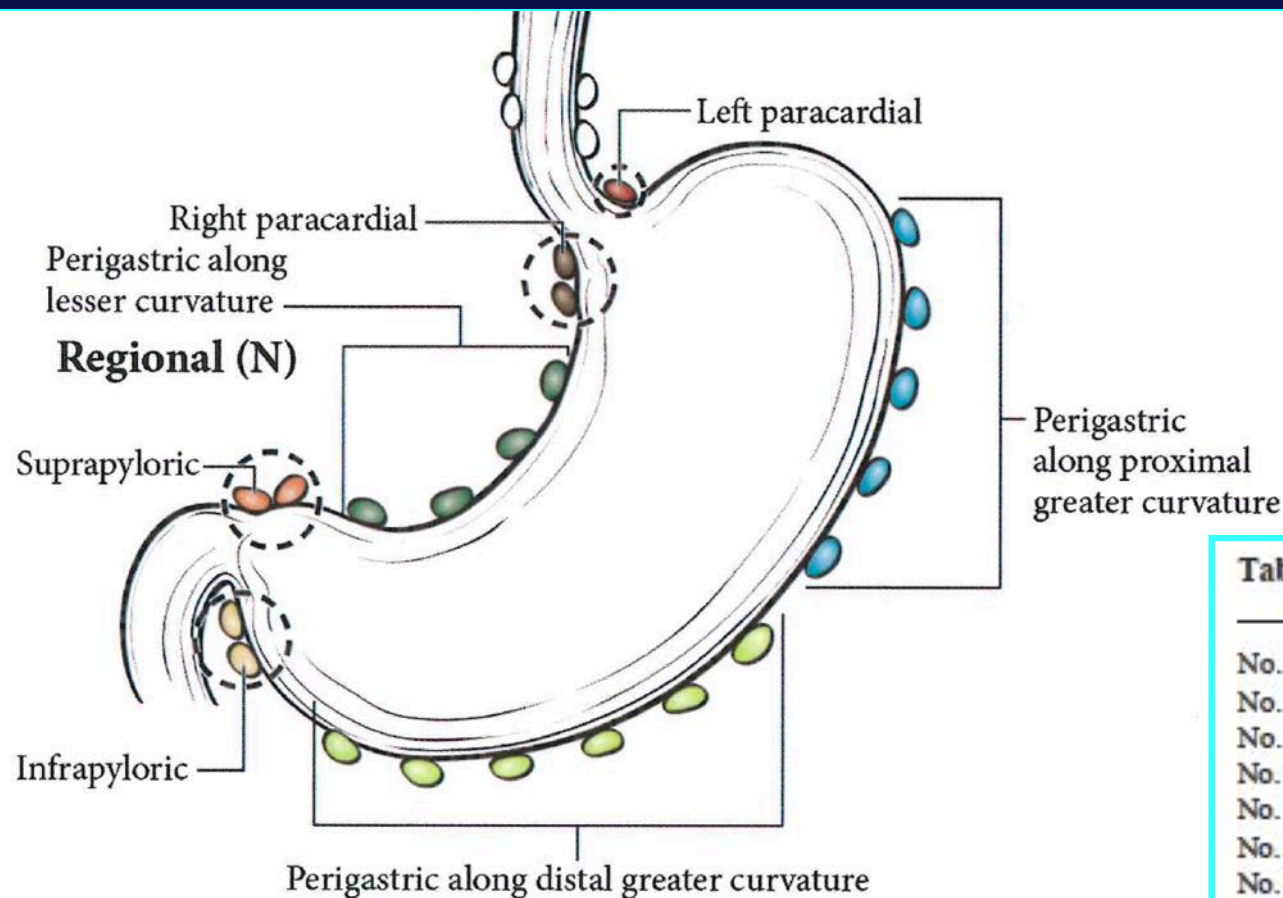
No. 1	Right paracardial LN
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No. 12a	LN in the hepatoduodenal ligament (along the hepatic artery)
No. 12b	LN in the hepatoduodenal ligament (along the bile duct)
No. 12p	LN in the hepatoduodenal ligament (behind the portal vein)



**Fig 1. Classification of lymph node groups based on anatomical location.** Lesser curvature (LC) group (station number 1, 3, and 5, according to Japanese classification), greater curvature (GC) group (station number 2, 4sa, 4sb, 4d, 6), and extra-perigastric (EP) group.

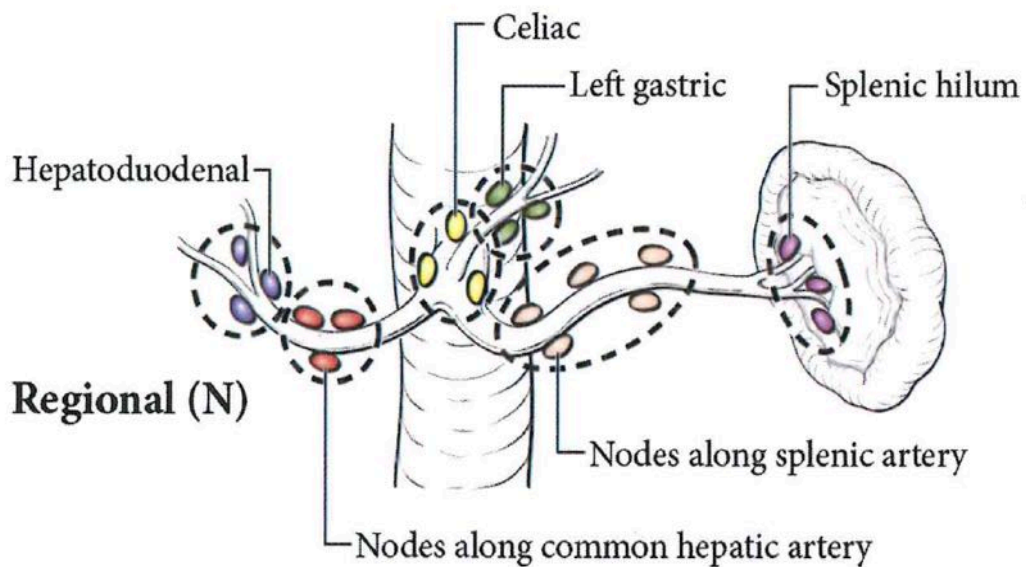


# AJCC 8th



**Table 2. Regional lymph nodes**

No. 1	Right paracardial LN
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**N: criteri**

**MISURATI SULL' ASSE CORTO**

**adiacenti al T: negativi < 5mm  
positivi > 5 mm**

**lontani dal T: positivi > 8 mm**

**VOLTERRANI  
ECR 2005**

**N STAGING. MSCT VS ISTOLOGIA: N agreement = 49/54**

		ISTOLOGIA			
		N0 (21)	N1 (13)	N2 (12)	N3 (8)
TC	N0	17			
	N1	4 *	13	1	
	N2			11	
	N3				8

**Accuratezza globale: 90.7%**

\* = 4/4 presentavano linfonodi macroscopicamente aumentati di dimensioni (istologia: istiocitosi dei seni)

**2nd JCGC**

**Accuratezza  
N2/N3: 95%**



## Lymph node metastasis: what is the best diagnostic tool we can use?

EUS: accuracy of 65 to 90% (*perigastric!*)  
 MRI: accuracy of 34 to 65% (*standard technique*)  
 accuracy of 97% (*USPIO??*)

Tomonori A, *Cancers* 2011  
 Tokuhara T, *Gastric Cancer* 2008

Table 3 Gastric cancer lymph node staging by positron emission tomography

Ref.	<i>n</i>	Sensitivity (%)		Specificity (%)	
		PET	PET	CT	CT
Chen <i>et al</i> <sup>[57]</sup>	61	61	92	77	62
Kim <i>et al</i> <sup>[64]</sup>	73	40	95	71	71
Mochiki <i>et al</i> <sup>[51]</sup>	85	23	100	65	77
Mukai <i>et al</i> <sup>[62]</sup>	62	34.50	97	62.10	87.90
Yeung <i>et al</i> <sup>[64]</sup>	23	22	97		
Yoshioka <i>et al</i> <sup>[73]</sup>	Low resolution	42	47	62	
	High resolution	41	73	78	
Yun <i>et al</i> <sup>[65]</sup>	81	35	97	52	94
Tian <i>et al</i> <sup>[78]</sup>	38	60	100		
Yang <i>et al</i> <sup>[79]</sup> (PET-CT)	78	37	97.20	60.50	83.30

Role of (<sup>18</sup>F)2-fluoro-2-deoxyglucose positron emission tomography in upper gastrointestinal malignancies. *WJG* 2011. Smyth EC *et al*

## *Limitation of FDG PET for the N-staging in gastric cancer*

- The sensitivity of PET appears to be influenced by the size of the metastatic foci (micrometastasis phenomena)*

*Less sensitive than CT for the detection of perigastric node because of the low spatial resolution that prevents the discrimination of the perigastric nodes from a primary tumour*

- Poor accuracy in gastric cancer with a low FDG uptake*

J Surg Oncol. 2016 Jan;113(1):42-5. doi: 10.1002/jso.24098. Epub 2016 Jan 19.

## Correlation between preoperative endoscopic ultrasound and surgical pathology staging of gastric adenocarcinoma: A single institution retrospective review.

Serrano OK<sup>1,2</sup>, Huang K<sup>2</sup>, Ng N<sup>2</sup>, Yang J<sup>2,3</sup>, Friedmann P<sup>2</sup>, Libutti SK<sup>1,2</sup>, Kennedy TJ<sup>1,2</sup>.

### + Author information

#### Abstract

**BACKGROUND:** Recent evidence validates the effectiveness of neoadjuvant chemotherapy in the treatment of gastric adenocarcinoma. Endoscopic ultrasonographic (EUS) staging has been proposed as a useful adjunct in this setting.

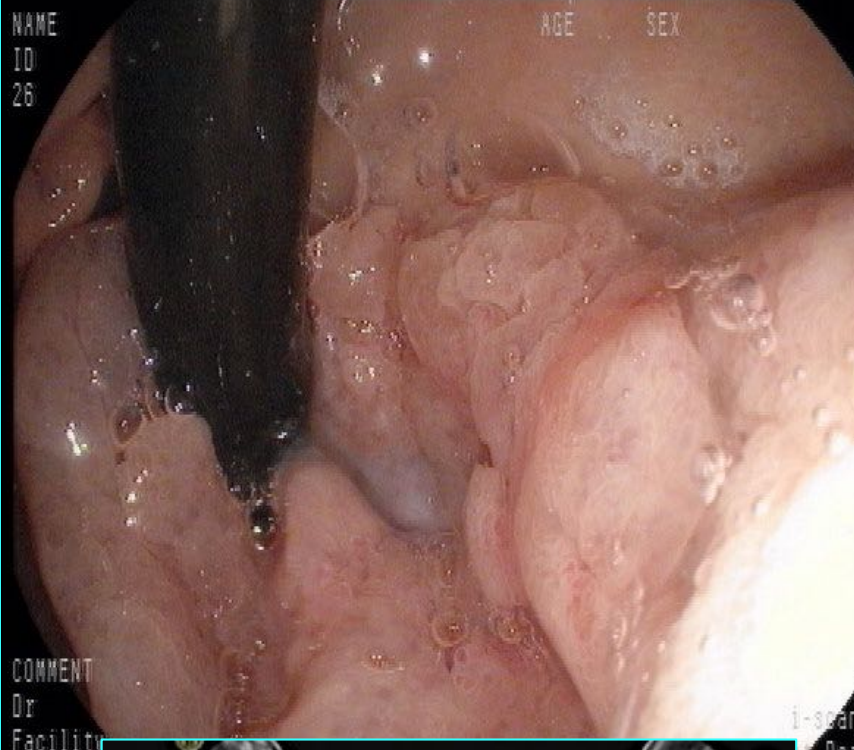
**METHODS:** We performed a retrospective review of patients treated at our institution for gastric adenocarcinoma between July 2005 and January 2014. We identified patients referred for EUS before surgery as part of a prospective treatment plan. Histopathologic staging was compared to EUS staging, with a focus on T- and N-stage. Agreement between the two modalities was examined using kappa-statistics.

**RESULTS:** We identified 614 patients with biopsy-proven gastric adenocarcinoma; 145 underwent curative-intent surgery. Surgical pathology and EUS results were available from 69 patients. The accuracy of EUS for the evaluation of T- and N-stage was 44.9% and

56.5%, respectively. The accuracy of EUS for the evaluation of T- and N-stage was 44.9% and 56.5%, respectively.

**CONCLUSION:** EUS seems to correlate poorly with pathology in the preoperative staging of gastric adenocarcinoma. In the majority of inaccurate cases, EUS underestimates T-stage and N-stage, limiting its utility in the neoadjuvant setting.





Cortesia Dr. Macchiarelli

# Evaluation of 64-Channel Contrast-Enhanced Multi-detector Row Computed Tomography for Preoperative N Staging in cT2-4 Gastric Carcinoma

World J Surg (2016) 40:165–171

*Senza distensione*

Scanning was started 80 s after the injection. The imaging parameters were as follows: rotation time, 0.5 s; section thickness and intervals, 1 mm; beam collimation, 1 mm; pitch, 53; 120 kVp; 200 mAs; field of view, 35 cm<sup>2</sup>; matrix, 512 × 512; and voxel size, 0.68 × 0.68 × 1 mm<sup>3</sup>. Using these raw datasets, we obtained axial images with a slice thickness of 1 mm and an interval of 1 mm.

regional lymph nodes were considered to be metastatic if they (1) had a short-axis diameter >8 mm (Fig. 1a); (2) were round and exhibited a central low-attenuation area, suggesting necrosis (Fig. 1a, b); and/or (3) exhibited clustering (three nodes or more) (Fig. 1a, c). Clustered nodes were staged as cN2 or cN3 according to the number of nodes estimated on the images.

The overall incidence of lymph node metastasis ( $\geq$ pN1) was 61.5 % (134/218). The preoperative diagnostic sensitivity, specificity, and accuracy for  $\geq$ pN1 were 79.1 % (106/134, 95 % CI: 72.1–86.1), 50.0 % (42/84, 95 % CI: 39.1–60.9), and 67.9 % (148/218, 95 % CI: 61.6–74.1), respectively.



**Asse corto**  
*adiacenti al T: negativi < 5mm.*  
*positivi > 5 mm.*  
*lontani dal T: positivi > 8 mm*

(VOLTERRANI et al. ECR 2005)

**3<sup>rd</sup> Japanese Classification**

**Lymph-node invasion was found in 83/135 (61.48%)**

**Diagnostic Results of CT at the Patient Level (135):**

TP	FP	TN	FN
81	11	41	2
sensitivity	specificity	PPV	NPV
98%	79%	88%	95%

**PATIENTS-LEVEL ANALYSIS**

**OVERALL ACCURACY: 90%**

**N-LEVEL ANALYSIS**

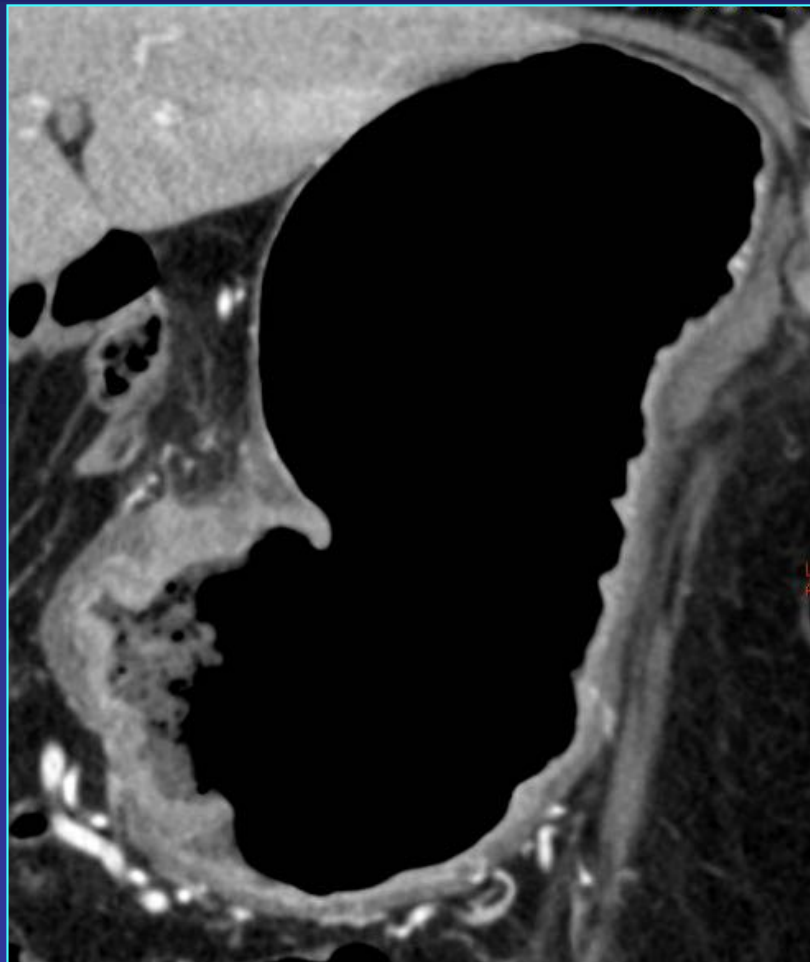
**N-Level:**

CONCORDANCE	104/135 (76.86%)
DISCORDANCE	31/135 (23.13%)

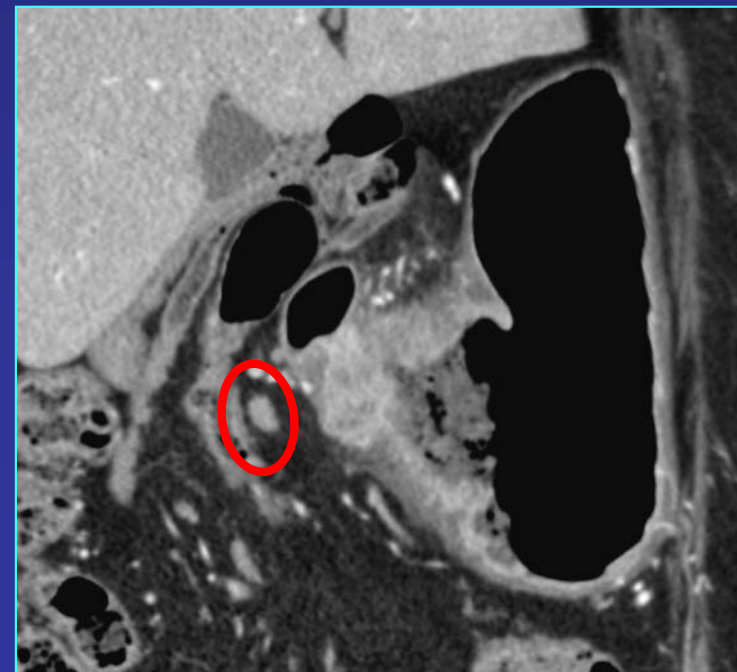
**OVERALL AGREEMENT: 77%**



**Pat. data: intestinal type, T3N0**  
**CT: T4aN2 (1 st.6 and 2 st. 3)**



**FP**



*Pat. data: intestinal type, T1bN1 (1 st. 3)  
CT: T1N0 (1 st.3 short axis 4.1mm)*

**FN**



***È probabile che intestinale e diffuso debbano avere cut off diversi***

# Diametro LN e Lauren

## N-dimensional ANALYSIS

METASTATIC LYMPH NODES: mean diameter 9.41mm (range 5 - 42mm)

I-LEVEL (n st. 168): mean diameter 8.83mm (range 5 - 40mm)

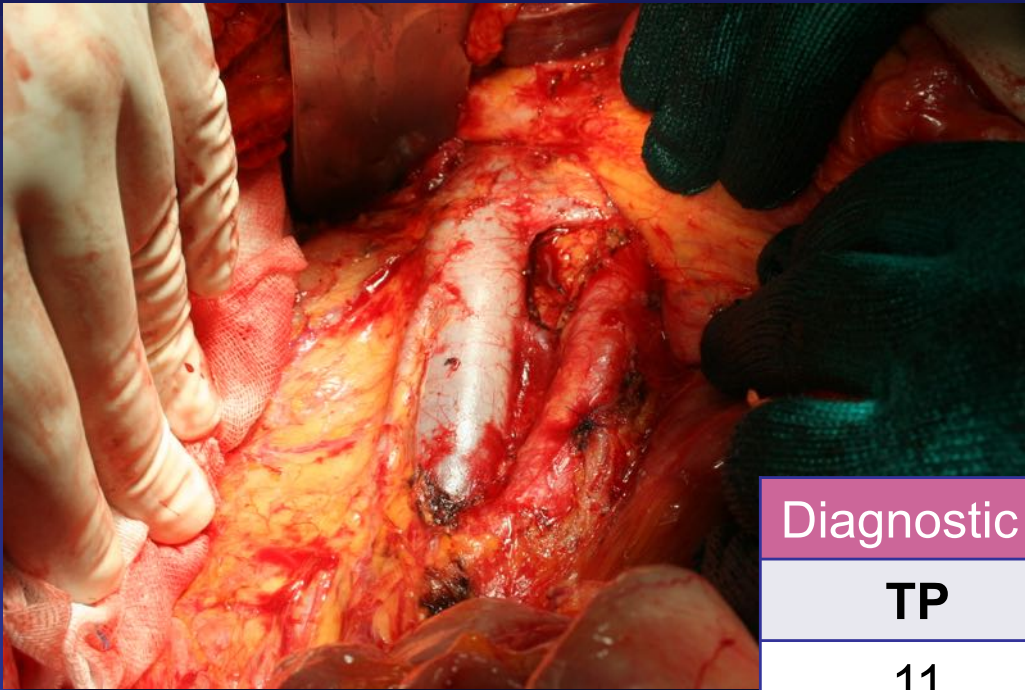
II-LEVEL (n st. 27): mean diameter 12.62mm (range 8 - 42mm)

Lauren type	Mean diameter (mm, range)
INTESTINAL	10.5 (5-42)
DIFFUSE	8.28 (5-20.7)
MIXED	8.31 (5-15)

$p = 0.01$



**PAND: para-aortic nodal dissection, involves the removal of para-aortic lymph-nodes in addition to the D2 dissection**



**Accuracy 93%**

Diagnostic Results of CT (92):

TP	FP	TN	FN
11	4	75	2
sensitivity	specificity	PPV	NPV
85%	95%	73%	97%

*Ann Surg Oncol.* 2011 Aug;18(8):2265-72. doi: 10.1245/s10434-010-1541-y. Epub 2011 Jan 26.

**High accuracy of multislices computed tomography (MSCT) for para-aortic lymph node metastases from gastric cancer: a prospective single-center study.**

Marrelli D, Mazzei MA, Pedrazzani C, Di Martino M, Vindigni C, Corso G, Morelli E, Volterrani L, Roviello F.

Department of Human Pathology and Oncology, Section of Advanced Surgical Oncology, University of Siena, Siena, Italy. marrelli@unisi.it

# ***E DOPO LA NEOADIUVANTE ?***

***Eseguire una dissezione D2, o addirittura D3, VS un intervento palliativo, modifica la morbilità e la mortalità***

## POST CT neoadiuvante (n=41)

### T+ vs T0

SENSIBILITA'	96,97%
SPECIFICITA'	100,00%
VPP	100,00%
VPN	50,00%



**CAPACITA' DI DISTINGUERE N0 da N+**  
**N = 41**

SENSIBILITA'	100,00%
<b>SPECIFICITA'</b>	<b>30,77%</b>
VPP	70,97%
VPN	100,00%
ACCURATEZZA TOTALE	74,29%

**CUT OFF: Perigastrici 5mm, extra 8mm**

# CONFRONTO CUT OFF DIVERSI

N = 41

NO\N+

CUT OFF 0,6-0,8

SENSIBILITA'	95,45%
SPECIFICITA'	53,85%
VPP	77,78%
VPN	87,50%
Accuratezza totale	80,00%

CUT OFF 0,5-0,8

SENSIBILITA'	100,00%
SPECIFICITA'	30,77%
VPP	70,97%
VPN	100,00%
Accuratezza totale	74,29%

# CONFRONTO ISTOTIPI

N = 41

NO\N+

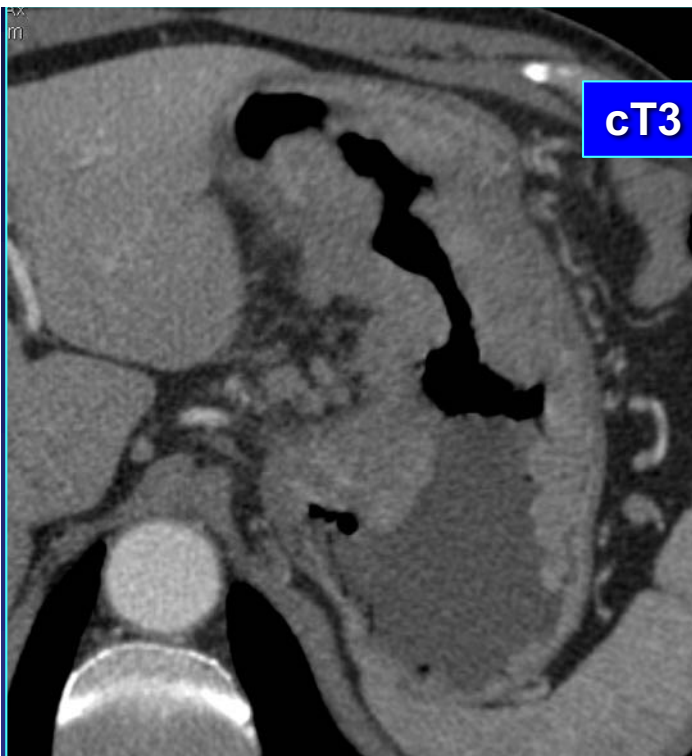
**DIFFUSI**

SENSIBILITA'	100,00%
SPECIFICITA'	60,00%
VPP	81,82%
VPN	100,00%
Accuratezza totale	85,71%

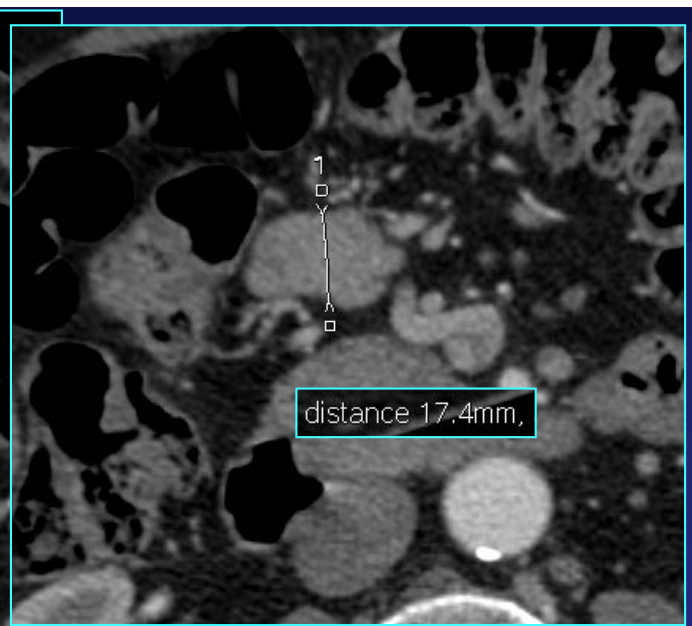
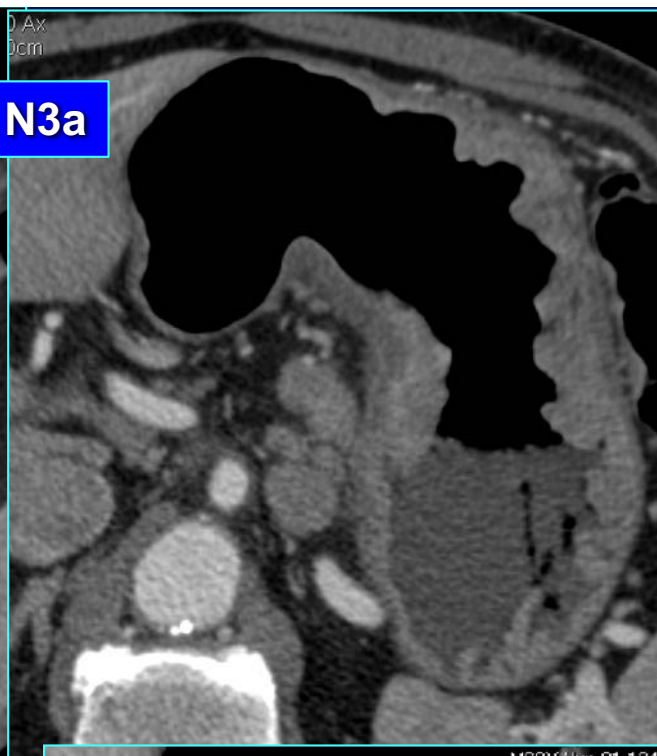
**INTESTINALI**

SENSIBILITA'	100,00%
SPECIFICITA'	12,50%
VPP	53,33%
VPN	100,00%
Accuratezza totale	56,25%

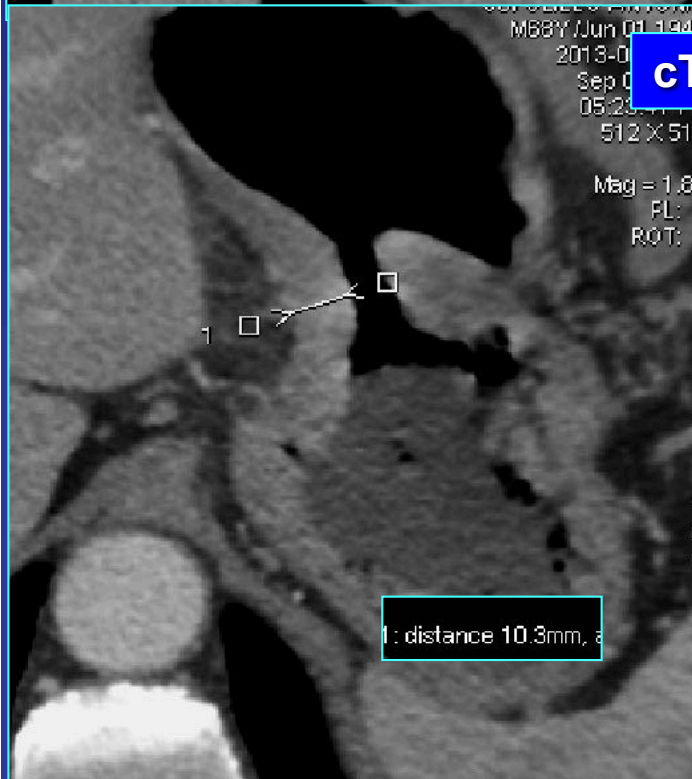




**cT3 N3a**

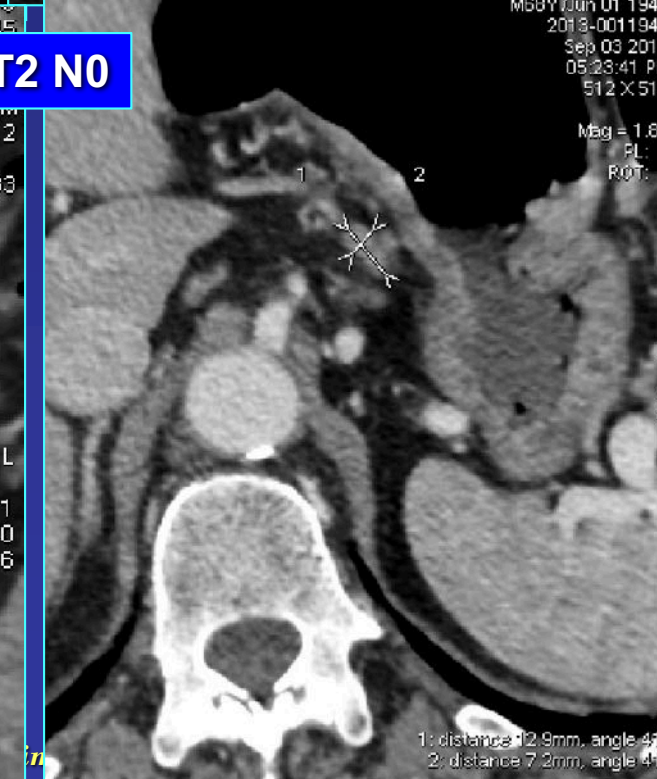


distance 17.4mm,



**cT2 N0**

1: distance 10.3mm, a

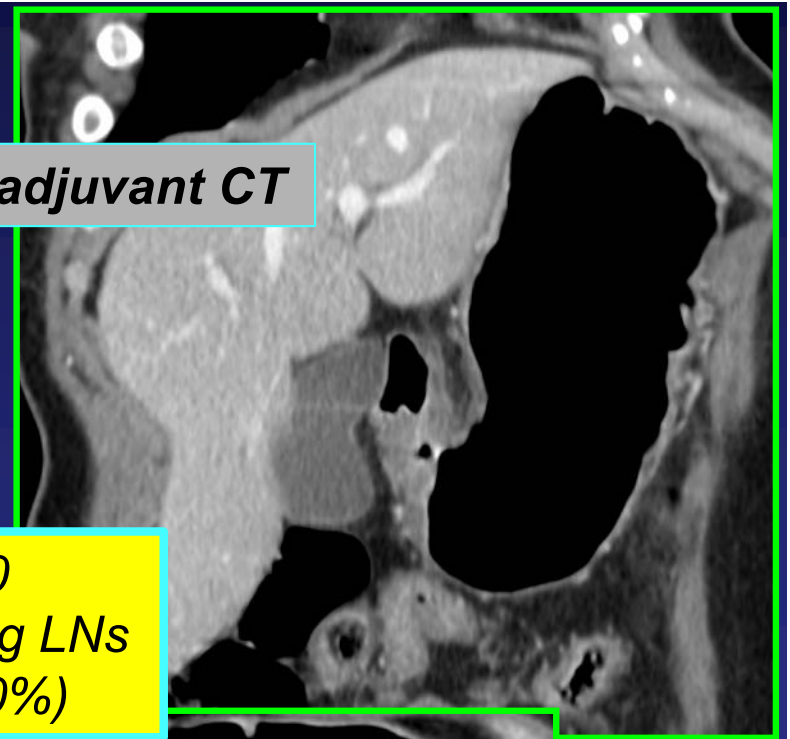
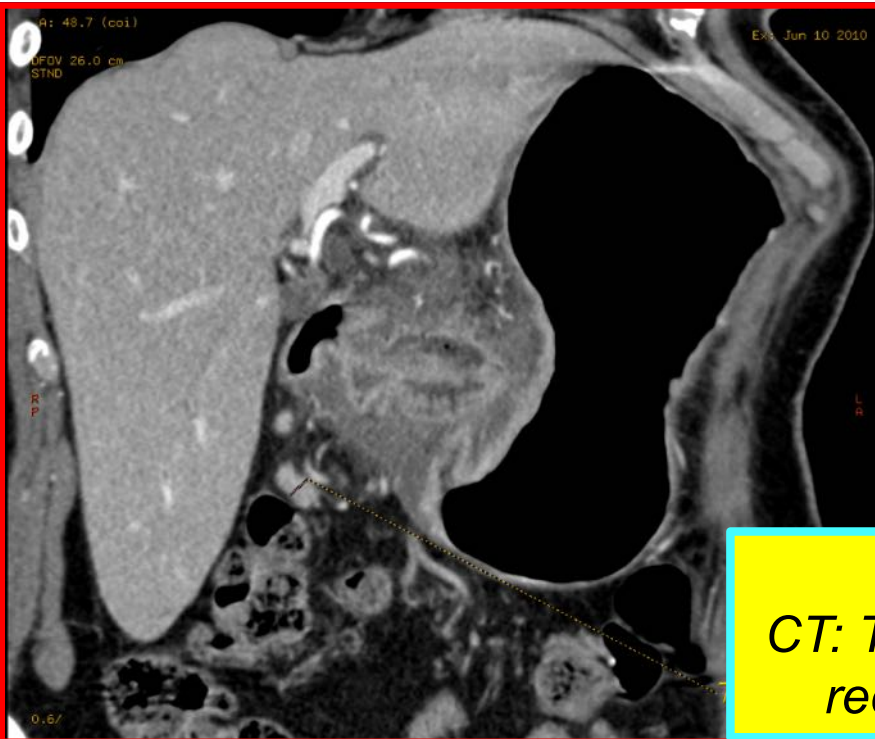


1: distance 12.9mm, angle 41°  
2: distance 7.2mm, angle 41°



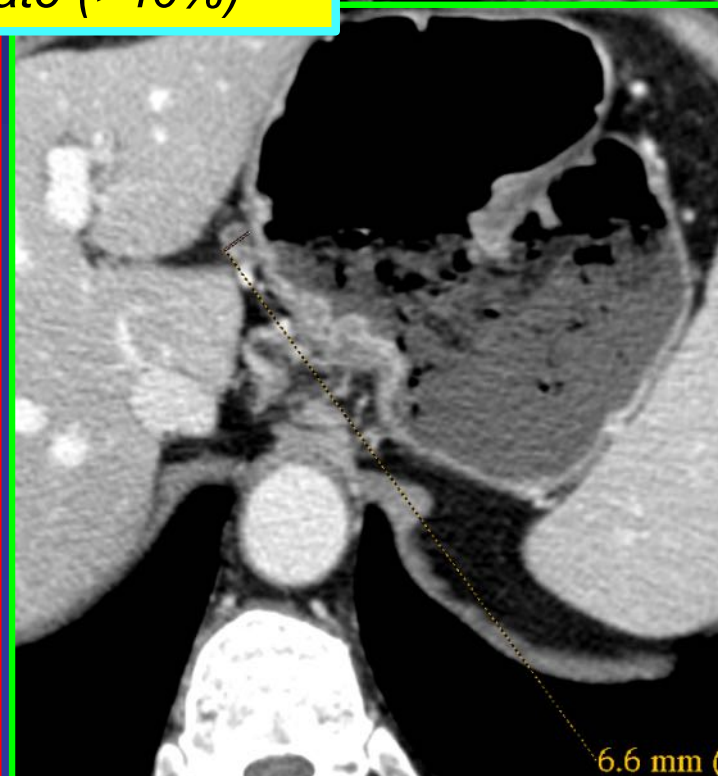
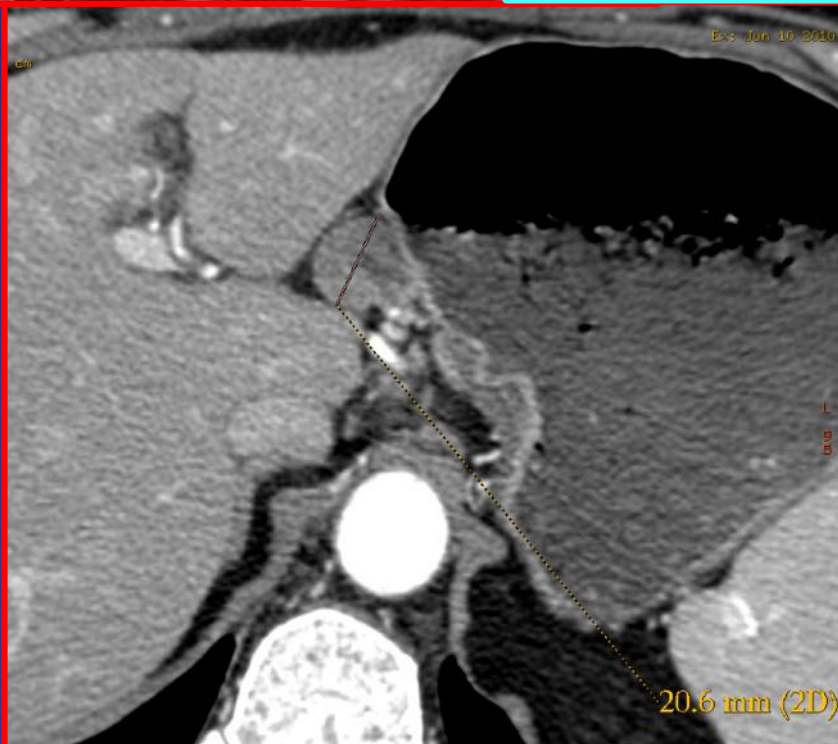
1: distance 12.6mm, a  
2: distance 5.7mm, a

**yT2 N0**



**After neoadjuvant CT**

**Path data: T0N0  
CT: T2N0, considering LNs  
reduction rate (>40%)**



## **Tumor regression grading systems**

***Becker et al.***

***1a. No residual tumor***

***1b. <10% Residual tumor***

***2. 10–50% Residual tumor***

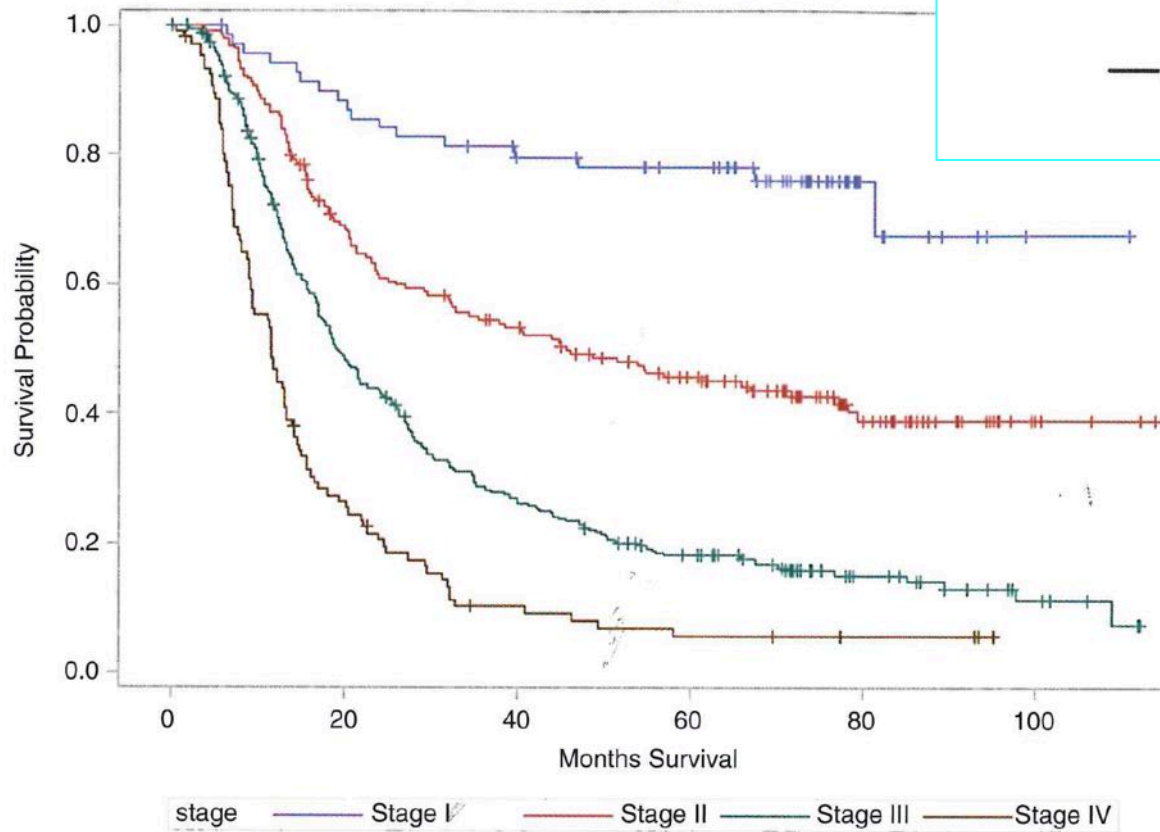
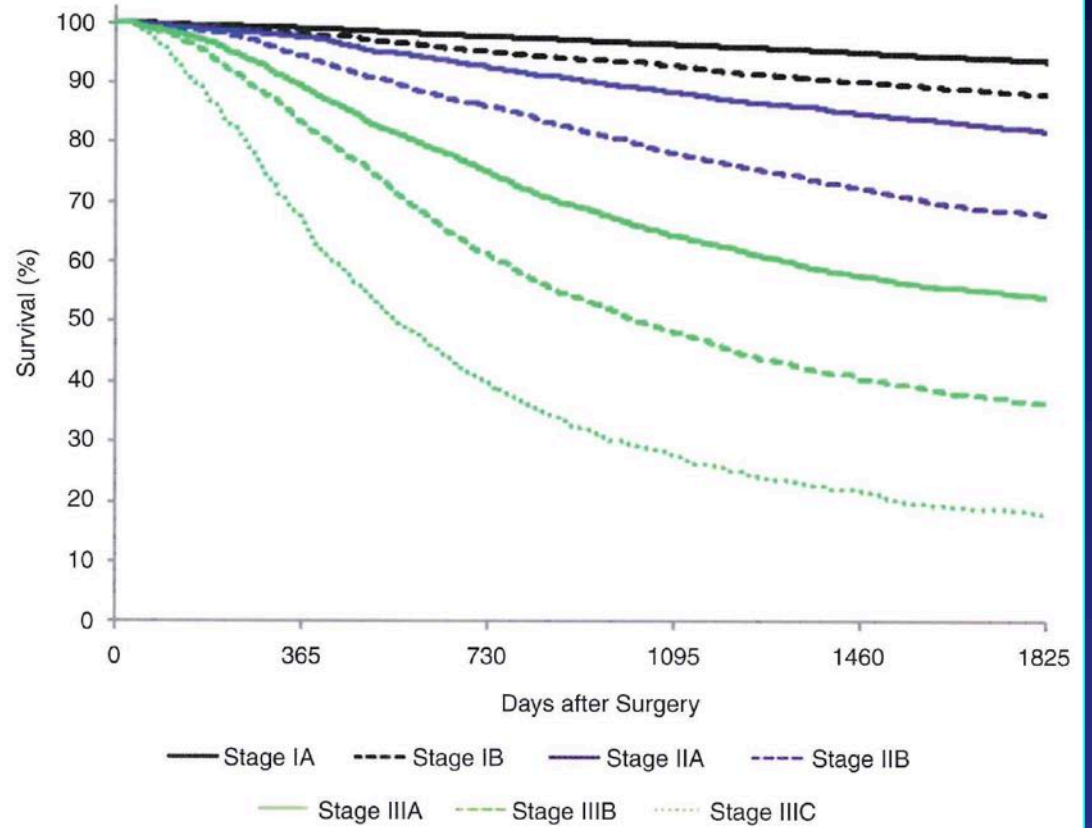
***3. >50% Residual tumor***



# AJCC 8th

ypTNM

Follow up 23 m.



pTNM

# Sopravvivenza per stadio pTNM vs ypTNM

AJCC 8th

**Table 17.3** Pathological stage and 1-, 3-, and 5-year and median overall survivals in patients with gastric cancer who received curative surgery, stratified by pathological stage groupings, based on IGCA data<sup>3</sup>

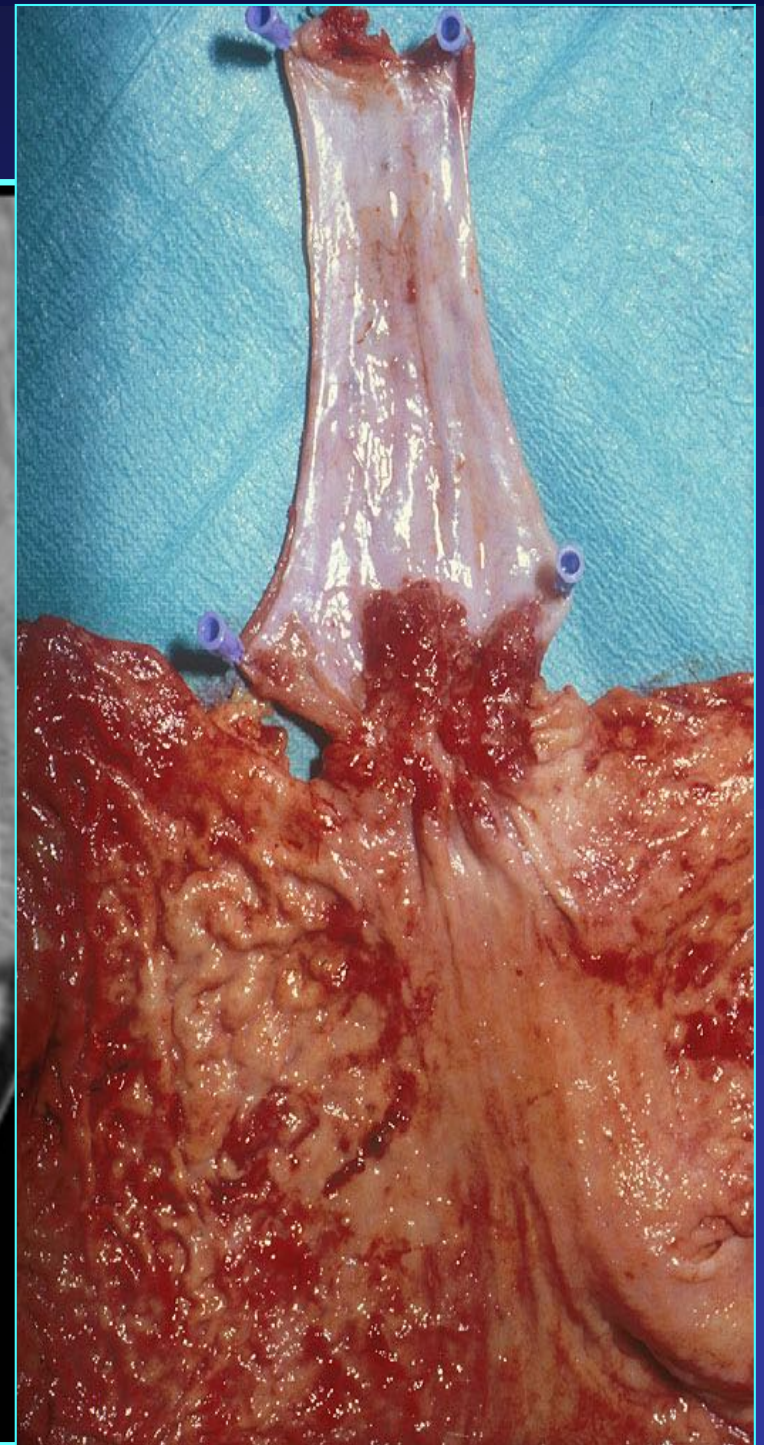
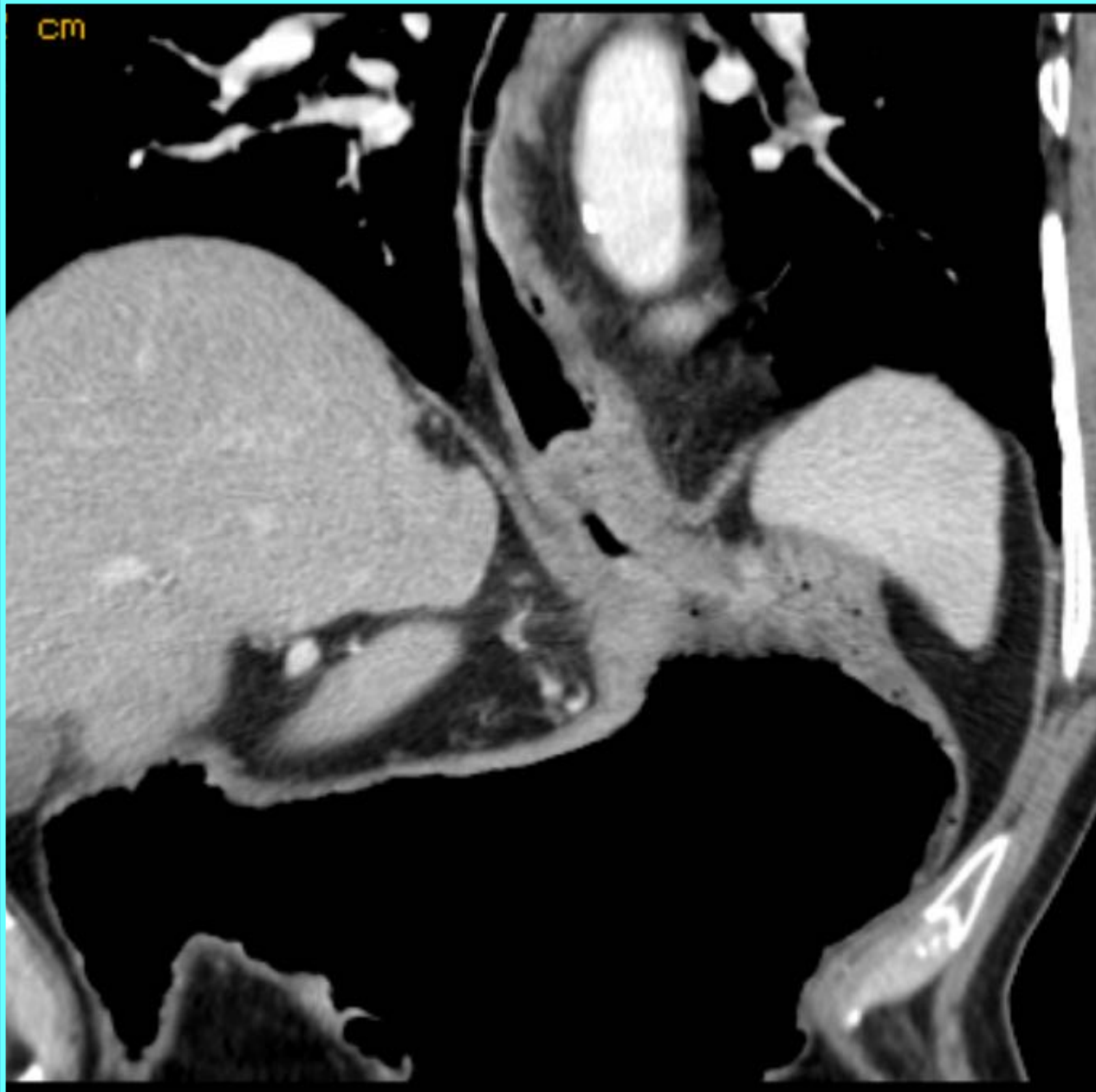
Pathological stage group	Patients, n	1-y Survival, %	3-y Survival, %	5-y Survival, %	Median survival
IA	10,606	99	96.30	93.60	Not reached
IB	2,606	98	92.80	88	Not reached
IIA	2,291	97.40	88.30	81.80	Not reached
IIB	2,481	94.30	78.20	68	Not reached
IIIA	3,044	89	64.40	54.20	Not reached
IIIB	2,218	83.10	48.20	36.20	32.8 mo
IIIC	1,350	66.80	27.70	17.90	18.5 mo

**Table 17.4** Post-neoadjuvant therapy stage (ypTNM) and 1-, 3-, and 5-year and median overall survivals in patients with gastric cancer, stratified by ypStage groupings, based on NCDB data

Posttreatment stage group	Patients, n	1-y Survival, %	3-y Survival, %	5-y Survival, %	Median survival, mo
I	70	94.3	81.4	76.5	117.8
II	195	86.7	54.8	46.3	46.0
III	301	71.7	28.8	18.3	19.2
IV	117	46.7	10.2	5.7	11.6



# TM giunzione esofago-gastrica





AEG I (-1 cm/+5 cm)

AEG II (+1 cm/-2 cm)

**SIEWERT JR 1998**

AEG III (-2cm/-5 cm)

**Tipo I: Centre o > 2/3  
between 5 e 1 cm above EGJ**

**Tipo II: Centre or > 2/3  
1cm above / 2 cm under EGJ**

**Tipo III: Centre or > 2/3 between 2  
and 5 cm from EGJ**

Esophagogastric  
junction

2 cm

B

Tumor  
epicenter

A

Esophagogastric  
junction

2 cm

Tumor  
epicenter

C

**AJCC 8th**

## **Progetti di ricerca GIRCG**

***Studio prospettico sulla validazione della Conversion Surgery nei pazienti con buona risposta alla CT neoadiuvante (stadi avanzati).***

**Validazione di protocolli terapeutici (Taxani VS altro) specifici per istotipo di Lauren.**

***Diagnostica per immagini sia nella valutazione predittiva dei risultati del trattamento sia nella valutazione del coinvolgimento peritoneale.***

### ***T-staging is difficult to assess***

*Dmax could be used to improve CT performance in the T -staging evaluation, considering its dependence on the Depth of invasion.*

*...but it essentially represents a prognostic factor and it should be evaluated in addition to the conventional T-staging*

**Lymph nodal assessment remains crucial in gastric cancer staging but it is still controversial**

**The two dimensional cut-off criteria for nodal staging seems to be a good tool; other criteria (enhancement) should be further evaluated**



## CONCLUSIONI

***CT examination represents the principle technique to assess T, lymph nodal status and M, due to its availability, high spatial resolution and large coverage.***

***ma...***

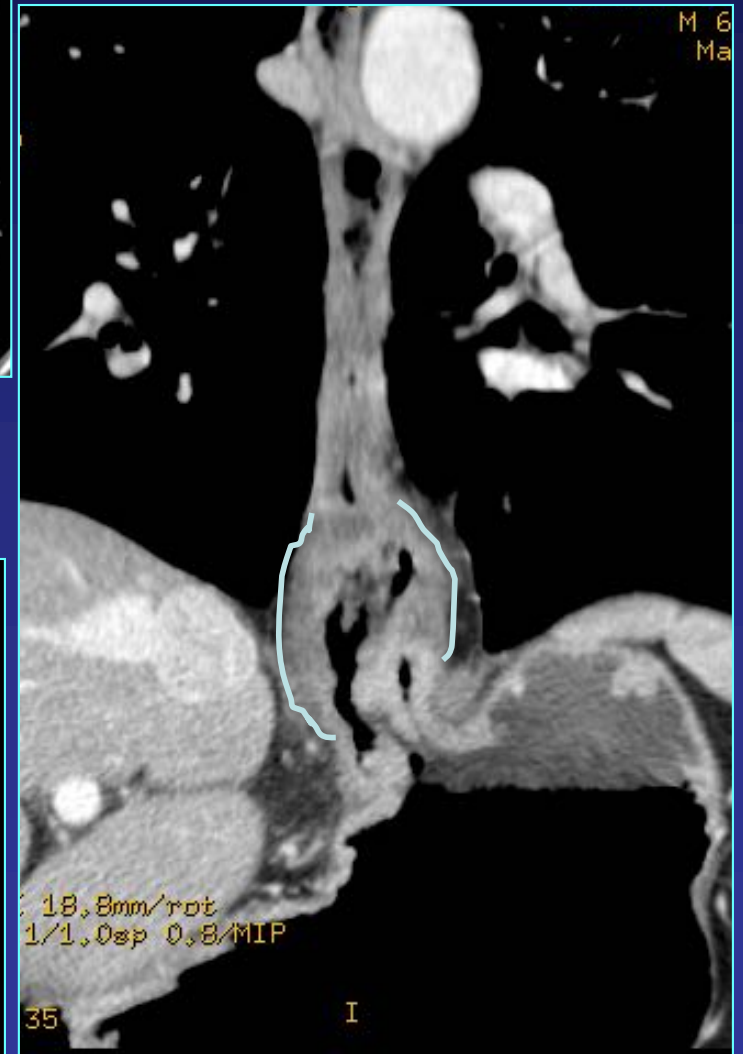
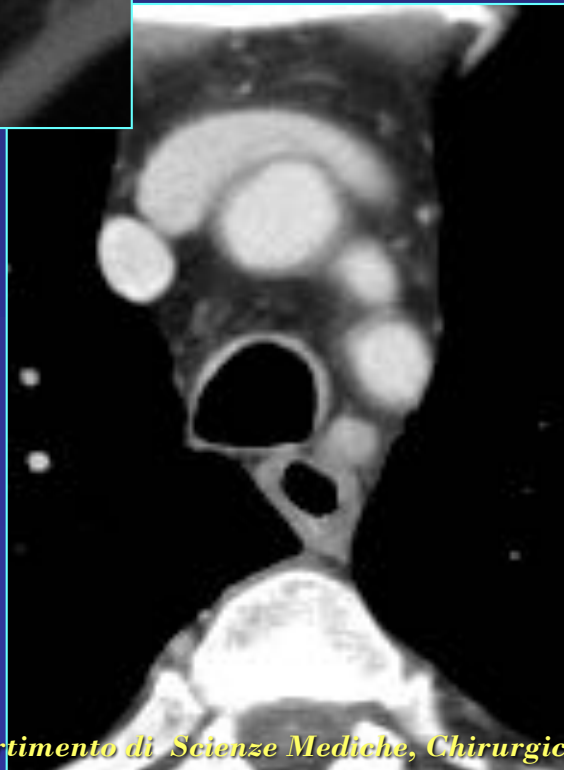
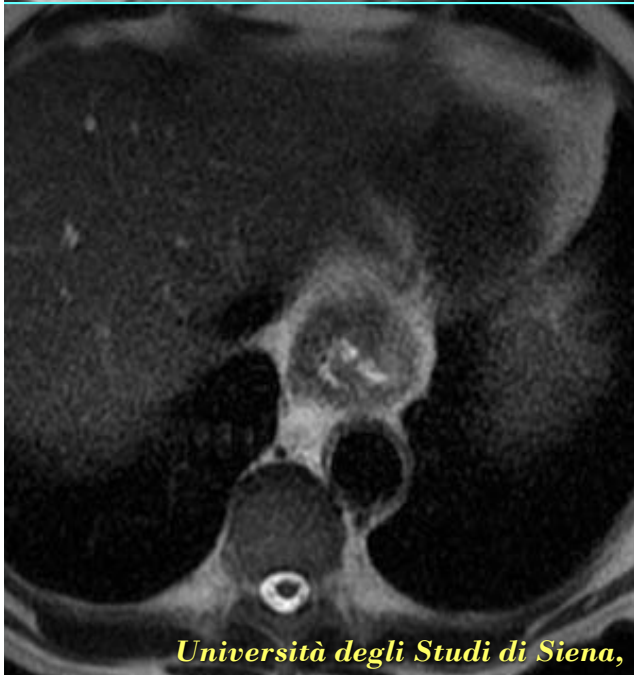
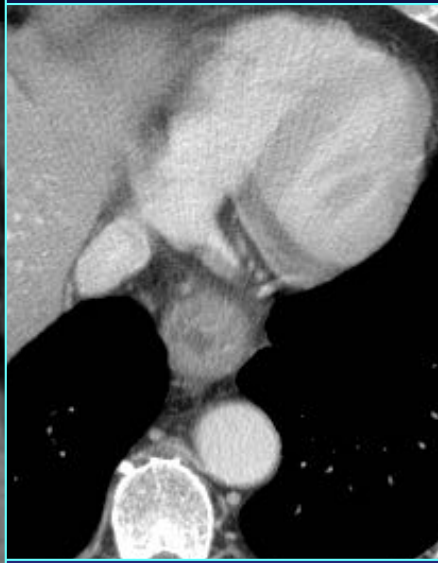
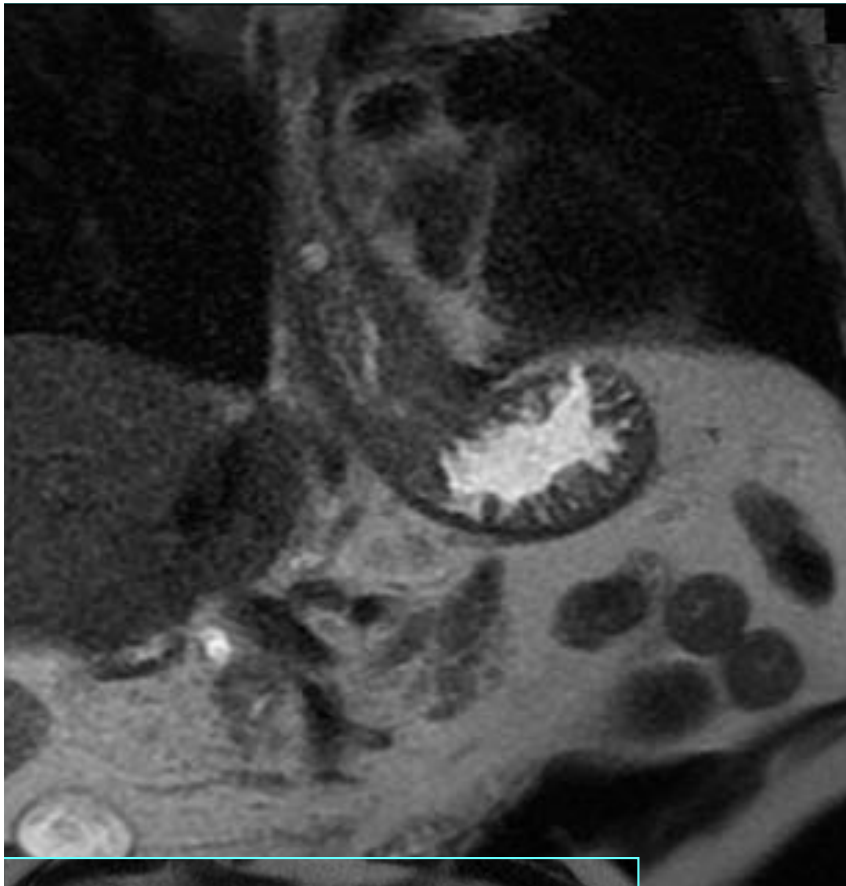
***Radiologo "interessato"***

***Chirurgo "dedicato"***









## ADK esofago







## Comparison between 18F-FDG PET/MRI and MDCT for the assessment of preoperative staging and resectability of gastric cancer<sup>☆</sup>

European Journal of Radiology 85 (2016) 1085–1091

*Purpose:* To investigate if 18F-FDG PET/MRI can improve the diagnostic performance of TNM staging and help make an accurate decision for resectability in patients with gastric cancer compared to MDCT.

*Materials and methods:* Forty-two patients with histologically confirmed gastric cancers underwent preoperative MDCT and 18F-FDG PET/MRI. M-staging and resectability was assessed in all patients, and T- and N-staging was evaluated in 30 of 42 patients who underwent curative gastrectomy. Two abdominal radiologists independently assessed their MDCT images and 18F-FDG PET/MRI and determined preoperative TNM staging and resectability of gastric cancers. Diagnostic performance with MDCT and 18F-FDG PET/MRI were compared using McNemar's test and receiver operating characteristic analysis.

*Results:* Diagnostic accuracies for T and N staging were not significantly different between MDCT and 18F-FDG PET/MRI in both readers. However, 18F-FDG PET/MRI showed significantly improved diagnostic accuracy for M staging in one reader ( $P = 0.008$ ) and marginal improvement in the other reader ( $P = 0.063$ ) compared to MDCT. Regarding the resectability of gastric cancers, diagnostic accuracy (92.9% for both readers) of 18F-FDG PET/MRI was significantly higher than that (76.2% for reader 1 and 64.3% for reader 2) of MDCT in both readers ( $P < 0.05$ ).

*Conclusion:* 18F-FDG PET/MRI may improve diagnostic accuracy for preoperative M staging as well as resectability of gastric cancers compared to MDCT.

## **Pre-operative lymph node status of gastric cancer evaluated by multidetector computed tomography**

Min Wang<sup>1\*</sup>, Yanwei Ye<sup>2,3\*</sup>, Qing Yang<sup>1</sup>, Jingjing Li<sup>4</sup>, Chao Han<sup>5</sup>, Wei Wang<sup>6</sup>, Chunlin Zhao<sup>2,3</sup>, Jianguo Wen<sup>3</sup>

In conclusion, the present analysis revealed that the diagnostic accuracy of MDCT concerning pre-operative N staging in gastric cancer patients was superior to that of EUS.



# POST CT neoadiuvante

RESULTS

**T**

**PATIENT-LEVEL ANALYSIS**

## *Diagnostic Results at the Patient Level for T (n=27):*

TP	FP	TN	FN
20	1	2	4
sensitivity	specificity	PPV	NPV
83%	67%	95%	33%

**Accuracy of 81%  
in distinguishing T0 from T+**



# POST CT neoadiuvante (n=41)

**T** ( $T \geq 3$  da  $T \leq 2$ )

**PATIENT-LEVEL ANALYSIS**

SENSIBILITA'	92,59%
SPECIFICITA'	71,43%
VPP	86,21%
VPN	83,33%
ACCURATEZZA TOTALE	85,37%

Figure 4. Pooled sensitivity, specificity, and summary receiver-operating characteristic (SROC) of MRI to diagnose T3-4 stage. AUC, area under the curve; CI, confidence interval; SE, standard error.

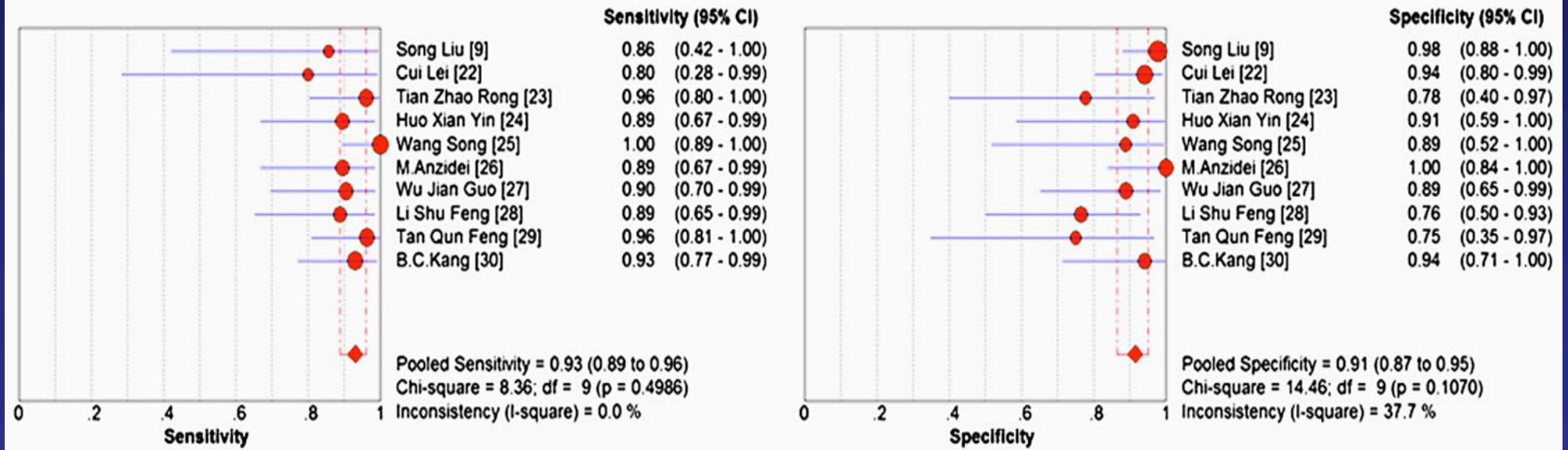
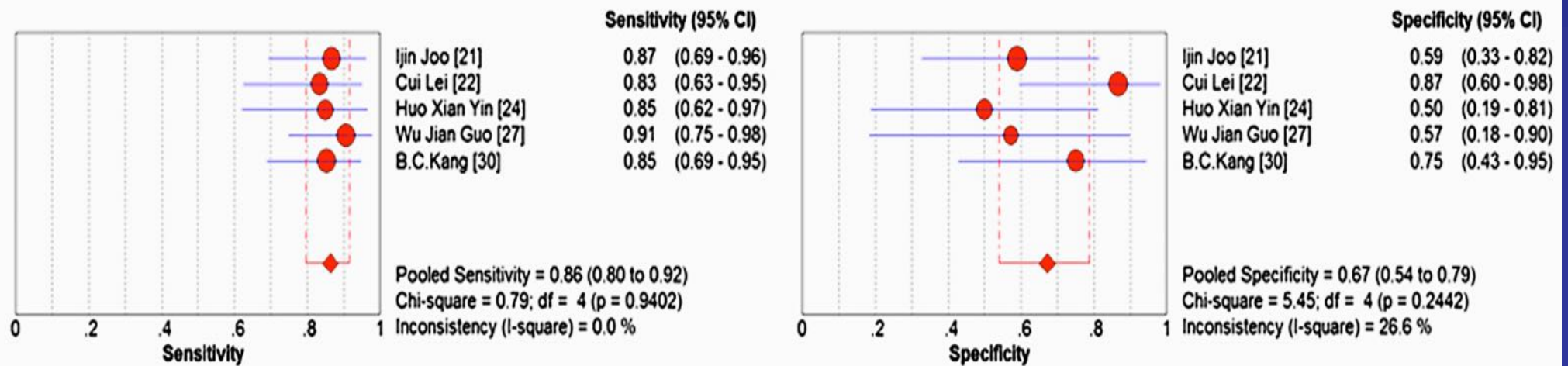


Figure 6. Pooled sensitivity, specificity and summary receiver-operating characteristic (SROC) of MRI to diagnose N stage. AUC, area under the curve; CI, confidence interval; df, degrees of freedom; SE, standard error.



## ***N. PATIENT-LEVEL ANALYSIS and REDUCTION RATE***

**Diagnostic Results at the Patient Level for N (n=27):**

TP	FP	TN	FN
16	6	5	0
sensitivity	specificity	PPV	NPV
100%	45%	73%	100%

*Accuracy of 78%  
in distinguishing N0 from N+  
(criterio dimensionale)*

***No disease if LN diameter  
reduction is >40%,  
(compared to the same LN  
diameter before neoCT)***

***Accuracy of 95%***

**Diagnostic Results at the Patient Level for N  
parameter with dimensional criteria + reduction  
rate (27):**

TP	FP	TN	FN
18	1	8	0
sensitivity	specificity	PPV	NPV
100%	89%	95%	100%

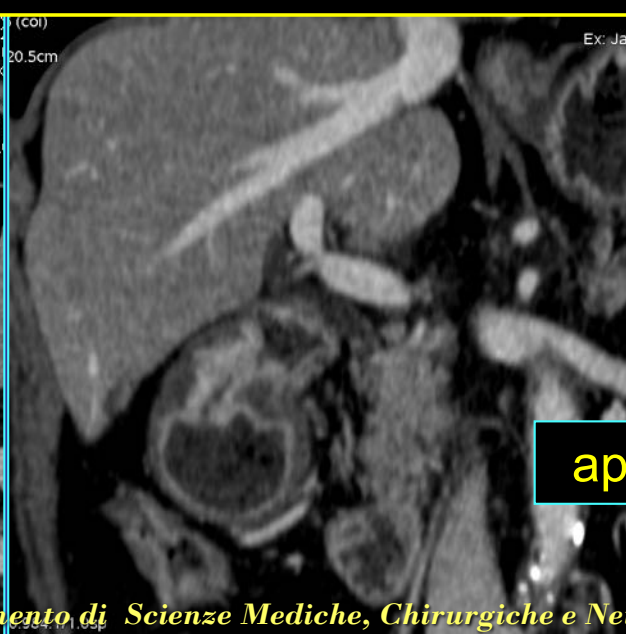
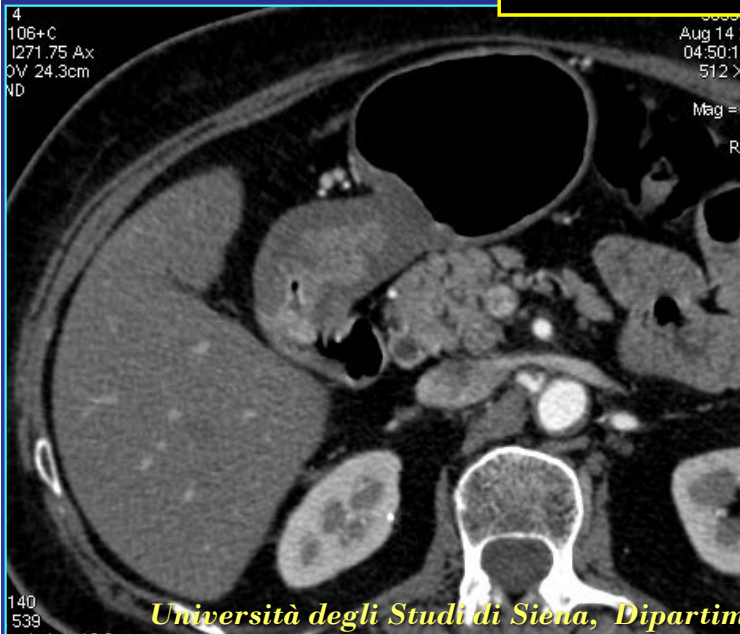


*The degree of contrast enhancement in undifferentiated gastric cancers could be decreased*



histological types!

*Inadequate distention or hypotonization of the gastric wall  
Inadequate technical parameter (slice thickness, RI)*



appropriate timing of CE-CT!

*mancata differenziazione tra T3 e T4a*



*T3 istologico / T4a TC*









**2nd JCGC: N1**

**3rd JCGC or TNM: N3**



# TNM and Japanese staging systems for gastric cancer: how do they coexist?

MAZIN E. SAYEGH<sup>1</sup>, TAKESHI SANO<sup>2</sup>, SIMON DEXTER<sup>3</sup>, HITOSHI KATAI<sup>2</sup>, TAKEO FUKAGAWA<sup>2</sup>, and MITSURU SASAKO<sup>2</sup>

*TNM:  
Prognostic Value*

*2nd JCGC:  
Guide to Treatment*

Gastric Cancer (2004)

## Abstract

Two staging systems for gastric cancer, International Union Against Cancer (UICC)/TNM and the Japanese classification, have been used widely for clinical practice and research. The two systems started independently in the 1960s, and underwent several revisions and amendments in order to approach each other, but have become more divergent in the latest editions because of characteristics based on different philosophies. The TNM system adopted a number-based system for N-staging that provides easy and accurate prognostic stratification. Comparative studies have shown that the TNM system has greater prognostic power than the Japanese classification. It contains, however, no treatment guidance and should primarily be used as a guide to prognosis. In contrast, the Japanese classification has been designed as a comprehensive guide to treatment, originally for surgeons and pathologists, and today for oncologists and endoscopists as well. Its anatomical-based N-staging was established based on analysis of lymphadenectomy effectiveness, and naturally provides direct surgical guidance. Clinicians should understand the roles of each system and must not mix the systems or terminology when they report their study results.



# PET-TC

Eur J Radiol. 2016 Jun;85(6):1085-91. doi: 10.1016/j.ejrad.2016.03.015. Epub 2016 Mar 19.

## **Comparison between 18F-FDG PET/MRI and MDCT for the assessment of preoperative staging and resectability of gastric cancer.**

Lee DH<sup>1</sup>, Kim SH<sup>2</sup>, Joo I<sup>1</sup>, Hur BY<sup>3</sup>, Han JK<sup>4</sup>.

### Author information

### **Abstract**

**PURPOSE:** To investigate if 18F-FDG PET/MRI can improve the diagnostic performance of TNM staging and help make an accurate decision for resectability in patients with gastric cancer compared to MDCT.

**MATERIALS AND METHODS:** Forty-two patients with histologically confirmed gastric cancers underwent preoperative MDCT and 18F-FDG PET/MRI. M-staging and resectability was assessed in all patients, and T- and N-staging was evaluated in 30 of 42 patients who underwent curative gastrectomy. Two abdominal radiologists independently assessed their MDCT images and 18F-FDG PET/MRI and determined preoperative TNM staging and resectability of gastric cancers. Diagnostic performance with MDCT and 18F-FDG PET/MRI were compared using McNemar's test and receiver operating characteristic analysis.

**RESULTS:** Diagnostic accuracies for T and N staging were not significantly different between MDCT and 18F-FDG PET/MRI in both readers. However, 18F-FDG PET/MRI showed significantly improved diagnostic accuracy for M staging in one reader ( $P=0.008$ ) and marginal improvement in the other reader ( $P=0.063$ ) compared to MDCT. Regarding the resectability of gastric cancers, diagnostic accuracy (92.9% for both readers) of 18F-FDG PET/MRI was significantly higher than that (76.2% for reader 1 and 64.3% for reader 2) of MDCT in both readers ( $P<0.05$ ).

**CONCLUSION:** 18F-FDG PET/MRI may improve diagnostic accuracy for preoperative M staging as well as resectability of gastric cancers compared to MDCT.

## **I dati della letteratura radiologica sono spesso fallaci per la presenza di numerosi BIAS**

Comparazione RM allo stato dell'arte con TC spessore 5 mm. (HCC !)

Metodica TC non adeguata (contrasto, fase, kernel, kV, mA etc.)

Le meta-analisi non hanno senso! (Tecnologia degli apparecchi e metodiche diverse)

Gold standard spesso non ottimale

## **Lung cancer**

**Vast majority of papers on diagnosis and staging of lung cancer are, at the least, absurd.**

**Abdominal CT: Sensitivity and Specificity rates for detection of regional nodal metastases ranged from 65 to 97% and 49 to 90% respectively**

**Gastric Cancer:** Preoperative Local Staging with 3D Multi-Detector Row CT—Correlation with Surgical and Histopathologic Results<sup>1</sup> Chen Y 2007

Radiology

**How to measure them?**

*short diameter: > 8mm  
or c.e. > 85 HU in portal phase*

**OVERALL ACCURACY 78%**

**Diagnostic Accuracy of Contrast-enhanced Multi-Detector Row CT for Each N Stage with Histopathologic Results as Reference Standard**

Type of Image and Stage at CT	Histopathologic Stage*				Accuracy (%)	Sensitivity (%)	Specificity (%)
	N0 (n = 18)	N1 (n = 26)	N2 (n = 7)	N3 (n = 4)			
<b>Transverse images</b>							
N0	14	5	0	0	84	78	86
N1	3	19	4	0	75	73	76
N2	1	2	3	1	85	43	92
N3	0	0	0	3	98	75	100
<b>MPRs</b>							
N0	13	3	0	0	85	72	92
N1	4	21	2	0	80	81	79
N2	1	2	5	0	91	71	94
N3	0	0	0	4	100	100	100

Note.—Overall accuracy of N staging was 71% (39 of 55 neoplasms) with transverse images and 78% (43 of 55 neoplasms) with MPRs.

\* Data are numbers of neoplasms.