Associazione
Italiana
Radioterapia
Oncologica

XXIII CONGRESSO
AIRO 2013
Giardini Naxos - Taormina, 26 - 29 ottobre

Presidente AIRO
Giovanni Mandoliti
Presidenti del Congresso
Francesco Marletta
Stefano Pergolizzi
Presidenti Onorari
Giampaolo Biti
Costantino De Renzis

DOMENICA 27 OTTOBRE 2013

SALA TINDARI A

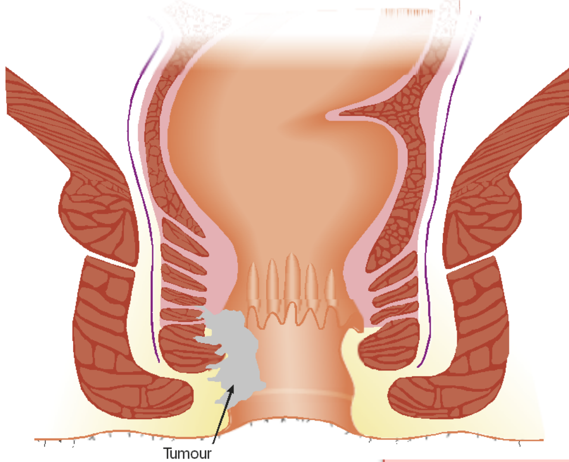
10.00 - 11.30 **SIMPOSIO AIRO-SIRM**
Iter diagnostico terapeutico nel carcinoma del canale anale
Moderatori: G. Biti, C. Faletti, A. Rotondo

Imaging morfo-funzionale nella stadiazione - **R. Grassi**
Approcci radio chemioterapici - **A. De Paoli**
Prescrizione e definizione dei volumi clinici - **G. Mantello**
Imaging morfo-funzionale nella valutazione della risposta - **A. Giovagnoni**

PRESCRIZIONE E DEFINIZIONE DEI VOLUMI CLINICI

Giovanna Mantello
gio@mobilia.it

Ca canale anale: trattamento standard



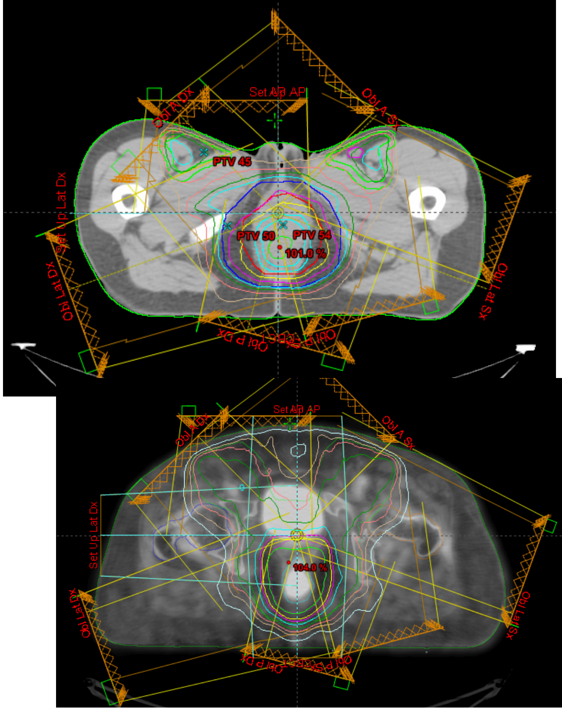
FUMIR

PLAFUR

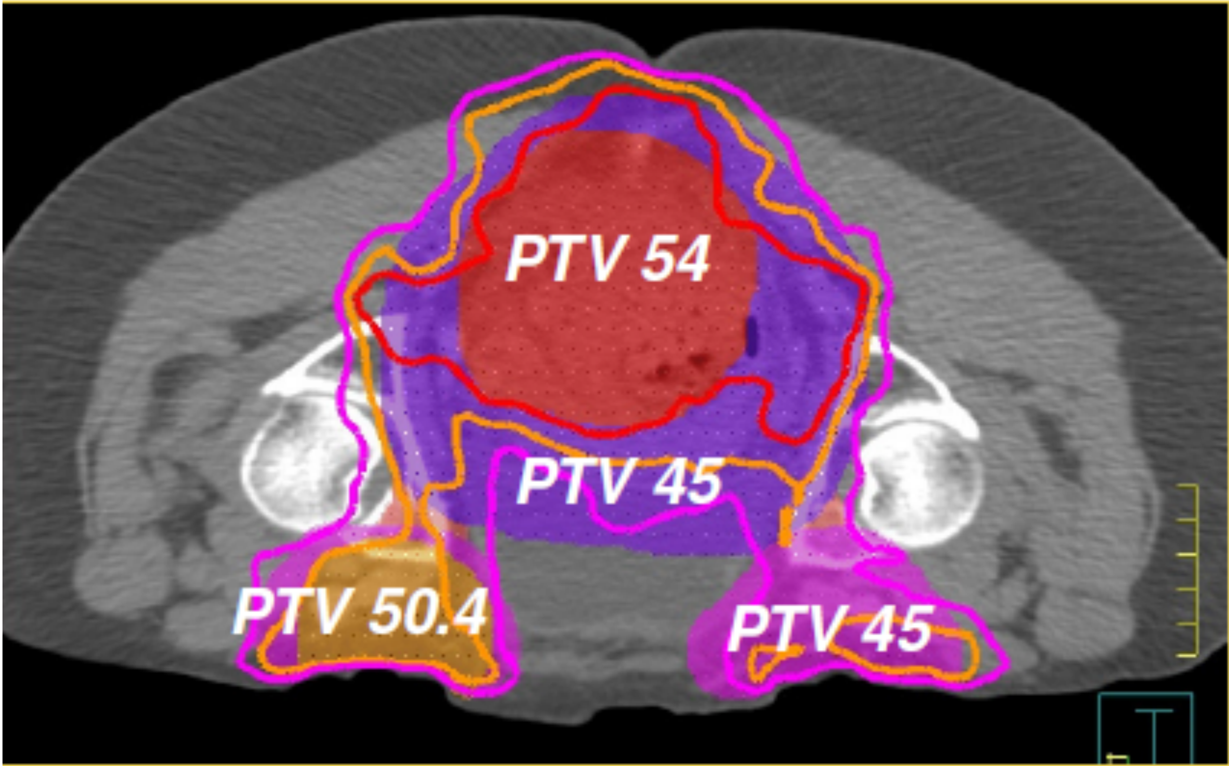
OTTIMO CONTROLLO LOCALE

RECIDIVE

TOSSICITA’



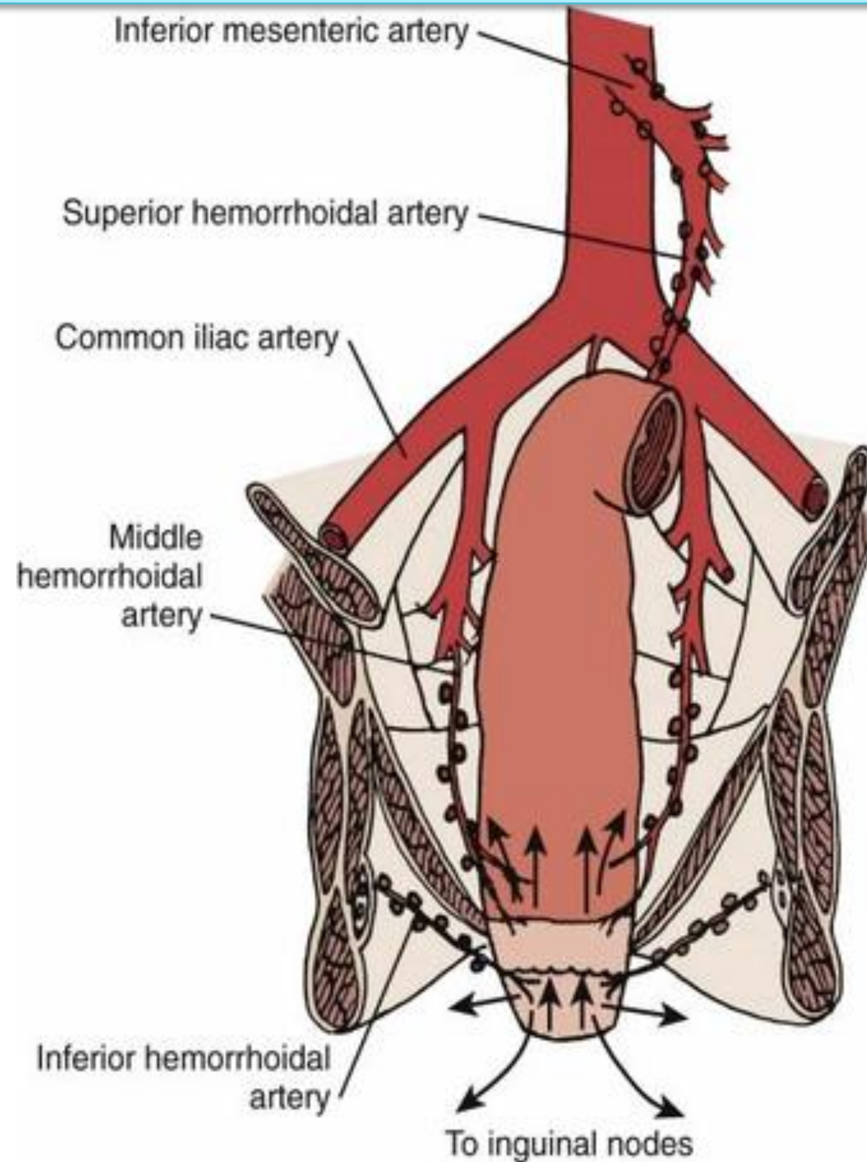
IMRT



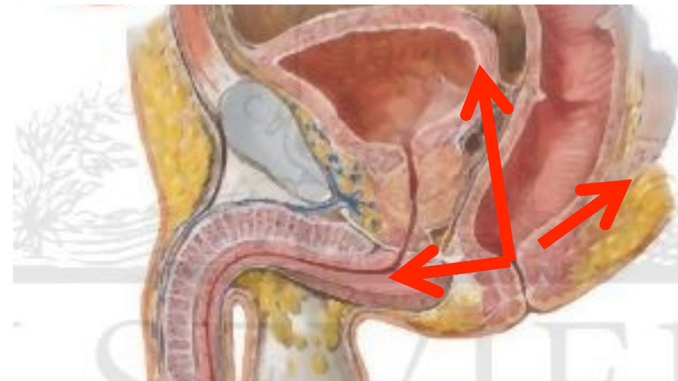
VANTAGGI

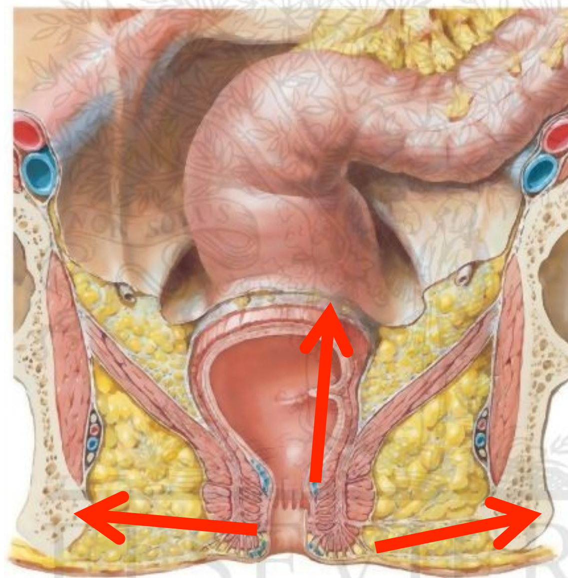
SVANTAGGI

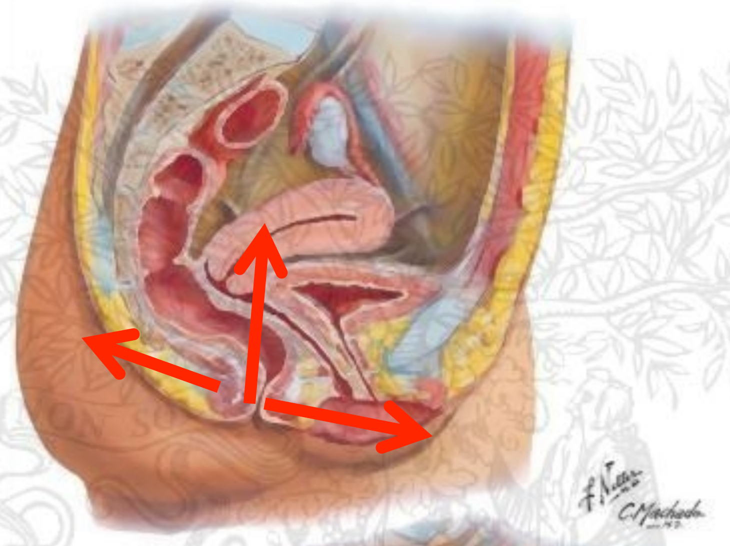
DIFFUSIONE LINFATICA



DIFFUSIONE LOCALE







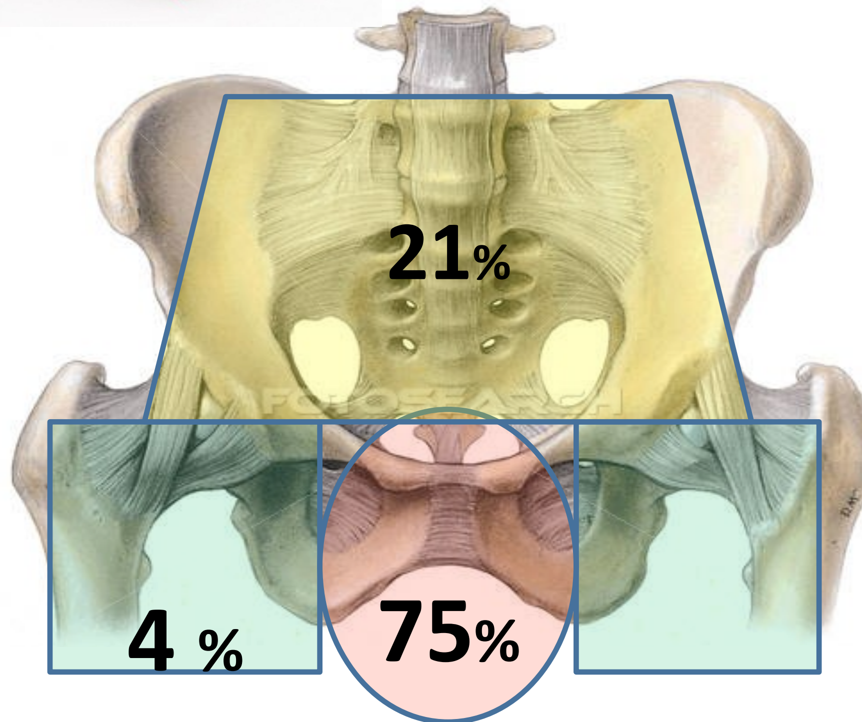
Patterns of recurrence

CLINICAL INVESTIGATION — Anal Canal

PREDICTORS AND PATTERNS OF RECURRENCE AFTER DEFINITIVE CHEMORADIATION FOR ANAL CANCER

Prajnan Das, M.D., M.S., M.P.H.,* Sumita Bhatia, M.D.,* Cathy Eng, M.D.,†
Jaffer A. Ajani, M.D.,† John M. Skibber, M.D.,‡ Miguel A. Rodriguez-Bigas, M.D.,‡
George J. Chang, M.D.,‡ Priya Bhosale, M.D.,§ Marc E. Delclos, M.D.,*
Sunil Krishnan, M.D.,* Nora A. Janjan, M.D., M.P.S.A.,* and Christopher H. Crane, M.D.,*

rtment of Gastrointestinal Medical Oncology, ‡Department of Surgical Oncology, and
ogy, The University of Texas M. D. Anderson Cancer Center, Houston, TX



167 pazienti
Recidiva in 14%

Table 7. Patterns of locoregional failure

Site	Number of failures (%)
Anus/rectum	18 (75)
Presacral/iliac	5 (21)
Inguinal	1 (4)

Das P, Bhatia S, Eng C, et al. Int J Radiat Oncol Biol Phys .68:794–800, 2007

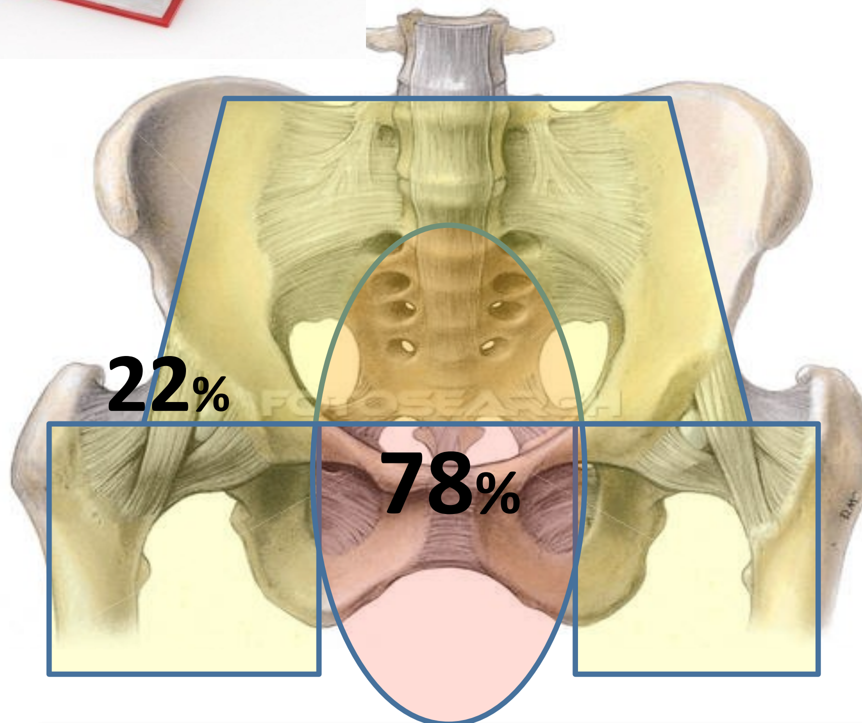
Patterns of recurrence

CLINICAL INVESTIGATION | Anal Canal

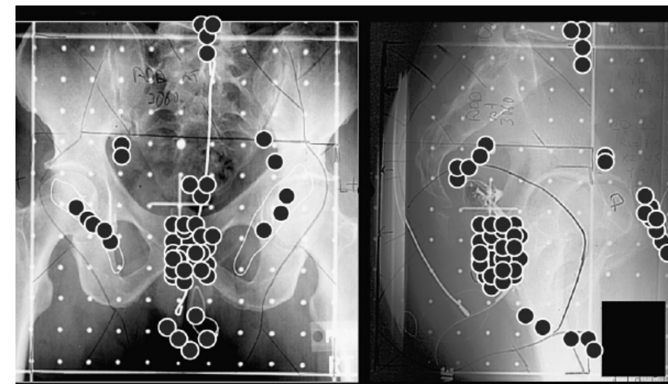
SQUAMOUS CELL CARCINOMA OF THE ANAL CANAL: PATTERNS AND PREDICTORS OF FAILURE AND IMPLICATIONS FOR INTENSITY-MODULATED RADIATION TREATMENT PLANNING

JEAN L. WRIGHT, M.D.,* SUJATA M. PATIL, PH.D.,† LARISSA K. F. TEMPLE, M.D.,‡ BRUCE D. MINSKY, M.D.,§ LEONARD B. SALTZ, M.D.,‖ AND KARYN A. GOODMAN, M.D.¶

*Department of Radiation Oncology, University of Miami, Miami, FL; †Department of Epidemiology and Biostatistics, Memorial Sloan-Kettering Cancer Center, New York, NY; ‡Department of Surgery, Memorial Sloan-Kettering Cancer Center, New York, NY; ...on and Cellular Oncology, University of Chicago Medical Center, Chicago, IL; ‖Department of Medicine, ...g Cancer Center, New York, NY; and ¶Department of Radiation Oncology, Memorial Sloan-Kettering Cancer Center, New York, NY



180 pazienti 1990 -2007
LRF a 3 anni = 23%.



J.L. Wright, Int. J. Radiation Oncology Biol. Phys., Vol. 78, 4,1064–1072, 2010

QUALE SEDE DI RECIDIVA?

IL CTV DOVREBBE INCLUDERE TUTTE LE AREE LINFONODALI PELVICHE

SEDE DI RECID

- L. ili
- atori
- L. presacrali
- L. mesorettali
- L. iliaci comuni
- L. inguinali
- CANALE ANALE

PRESCRIZIONE DEI VOLUMI CLINICI

INCLUSIONE DEI LINFONODI ILIACI COMUNI

Il CTV dovrebbe includere gli iliaci comuni sempre nei pazienti con neoplasia T3-4;

alcune linee guida invece suggeriscono di contornare gli iliaci comuni solo nei casi con positività linfonodale sulla regione craniale degli iliaci esterni ed interni

M. Ng, T. Leong, S. Chander et al. (AGITG) Int J Radiation Oncol Biol Phys, 83, 5, 1455-1462, 2012

PRESCRIZIONE DEI VOLUMI CLINICI

INCLUSIONE DEI LINFONODI INGUINALI: IRRADIAZIONE PROFILATTICA

STUDIO	PII
EORTC 1997	NO
ACT II 2009	SI
ACCORD 3 2009	A DISCREZIONE DEL RADIOTERAPISTA

Bartelink H, J Clin Oncol 15: 2040–2049,1997.
Flam M, J Clin Oncol 14: 2527–2539,1996.
James J Clin Oncol 2009;18s. abstr LBA4009. 2.3.
Conroy T, J Clin Oncol;27:15s (suppl; abstr 4033), 2009

PRESCRIZIONE DEI VOLUMI CLINICI

INCLUSIONE DEI LINFONODI INGUINALI: IRRADIAZIONE PROFILATTICA

AUTORE	N° PAZ N0 NO PII	RECIDIVA INGUINALE	
GERARD JP 2001	243	7.8 %	
FERRIGNO R 2005	43	15 %	
NUYTTENS J 2012	160	T1	0%
		T2	12 %
		T3	17 %
		T4	18%
		T>4 cm	19%
		T<4 cm	4%

Gerard JP. Cancer;92:77–84, 2001.
Ferrigno R. Int J Radiat Oncol Biol Phys;61:1136–1142,2005
J. Nuyttens, Int. J. Radiation Oncology Biol. Phys Vol.84, 3S, Supplement 2012

PRESCRIZIONE DEI VOLUMI CLINICI

INCLUSIONE DEI LINFONODI INGUINALI: IRRADIAZIONE PROFILATTICA

Patients
inguinal n

Patients N0/N1
n=178

No PII
n=106

PII
n=72

Inguinal
Recurrence
n= 14

Inguinal
Recurrence
n=0

Cumulated rate of inguinal recurrence

1,0
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0,0

No prophylactic inguinal irradiation
Prophylactic inguinal irradiation
P=0.006

16%

2%

0 12 24 36 48 60 72 84 96 108 120

Time (months)

C. Ortholan (**CORS-03** Study). Int. J. Radiation Oncology Biol. Phys., Vol.82, 5, 1988–1995, 2012

PRESCRIZIONE DEI VOLUMI CLINICI

INCLUSIONE DEI LINFONODI INGUINALI: IRRADIAZIONE PROFILATTICA

Table 3. 5-year cumulative rate of inguinal recurrence (Kaplan-Meier method) according to patient and tumor features

No prophylactic inguinal irradiation group

	Yes	9%	
T stage	T1-T2	12%	0.02
	T3-T4	30%	
T size	≤4 cm	13%	0.31
	>4 cm	19%	
Margin involvement	No	15%	0.92
	Yes	18%	
Tumor >2/3 circumference	No	14%	0.58
	Yes	25%	
Concurrent chemotherapy	Yes	16%	
	No	18%	0.76

CONCLUSIONI:
l'irradiazione profilattica alla dose di 45 Gy e' sicura ed efficace e deve essere raccomandata nei T3-4; l'indicazione per i T1-2 può essere argomento di discussione anche se il rischio di recidiva non e' trascurabile (10%)

C. Ortholan (**CORS-03** Study). Int. J. Radiation Oncology Biol. Phys., Vol.82, 5, 1988–1995, 2012

DELINEAZIONE CTV LINFONODALE

PHYSICS CONTRIBUTION

MAPPING PELVIC LYMPH NODES: GUIDELINES FOR DELINEATION IN INTENSITY-MODULATED RADIOTHERAPY

ALEXANDRA TAYLOR, F.R.C.R.,* ANDREA G. ROCKALL, F.R.C.R.,† RODNEY H. REZNEK, F.R.C.R.,† AND MELANIE E. B. POWELL, M.D., F.R.C.R.*

Departments of *Radiotherapy and †Radiology, St. Bartholomew's Hospital, London, United Kingdom

CLINICAL INVESTIGATION Rectum

DEFINITION AND DELINEATION OF THE CLINICAL TARGET VOLUME FOR RECTAL CANCER

SARAH ROELS, M.D.,* WIM DUTHOY, M.D.,§ KARIN HAUSTERMANS, M.D., PH.D.,*

...RBERG, M.D.,§

CLINICAL INVESTIGATION Rectum

ELECTIVE CLINICAL TARGET VOLUMES FOR CONFORMAL THERAPY IN ANORECTAL CANCER: A RADIATION THERAPY ONCOLOGY GROUP CONSENSUS PANEL CONTOURING ATLAS

ROBERT J. MYERSON, M.D., PH.D.,* MICHAEL C. GAROFALO, M.D.,† ISSAM EL NAQA, PH.D.,* ROSS A. ABRAMS, M.D.,‡ ADITYA APTE, PH.D.,* WALTER R. BOSCH, PH.D.,* PRAJNAN DAS, M.D.,§ LEONARD L. GUNDERSON, M.D.,‖ THEODORE S. HONG, M.D.,¶ J. J. JOHN KIM, M.D.,# CHRISTOPHER G. WILLETT, M.D.,** AND LISA A. KACHNIC, M.D.††

...ls Group (AGITG) ...idelines for Intensity-Modulated Radiotherapy in Anal Cancer

Michael Ng, M.B.B.S.(Hons), F.R.A.N.Z.C.R.,*
Trevor Leong, M.B.B.S., M.D., F.R.A.N.Z.C.R.,†,‖
Sarat Chander, M.B.B.S., F.R.A.N.Z.C.R.,† Julie Chu, M.B.B.S., F.R.A.N.Z.C.R.,†
Andrew Kneebone, M.B.B.S., F.R.A.N.Z.C.R.,‡,**
Susan Carroll, M.B.B.S., F.R.A.N.Z.C.R.,§,** Kirsty Wiltshire, M.B.B.S., F.R.A.N.Z.C.R.,†
Samuel Ngan, M.B.B.S., F.R.C.S.Ed., F.R.A.N.Z.C.R.,†,‖ and Lisa Kachnic, M.D.¶

DELINEAZIONE CTV LINFONODALE

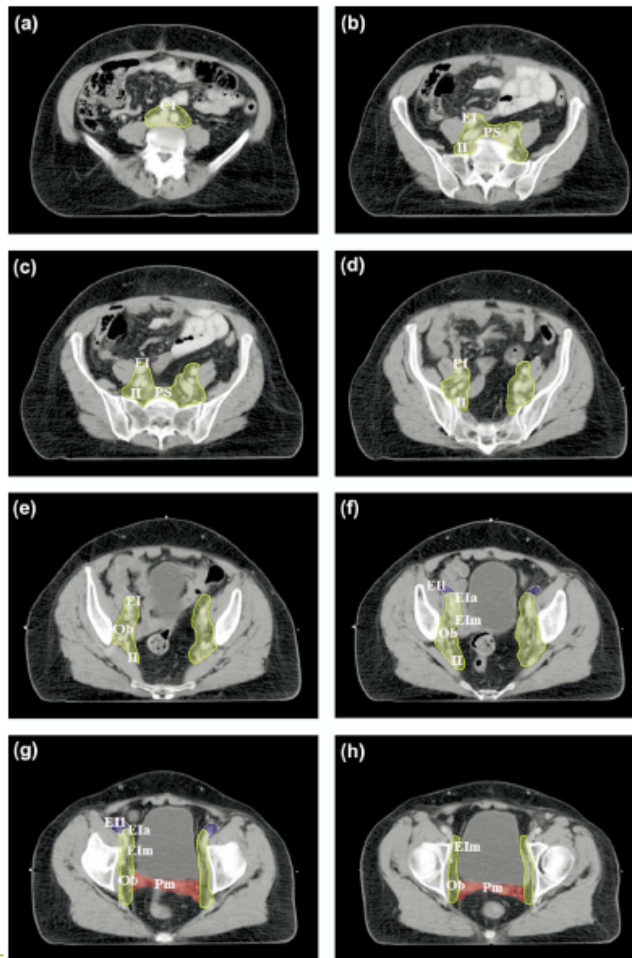


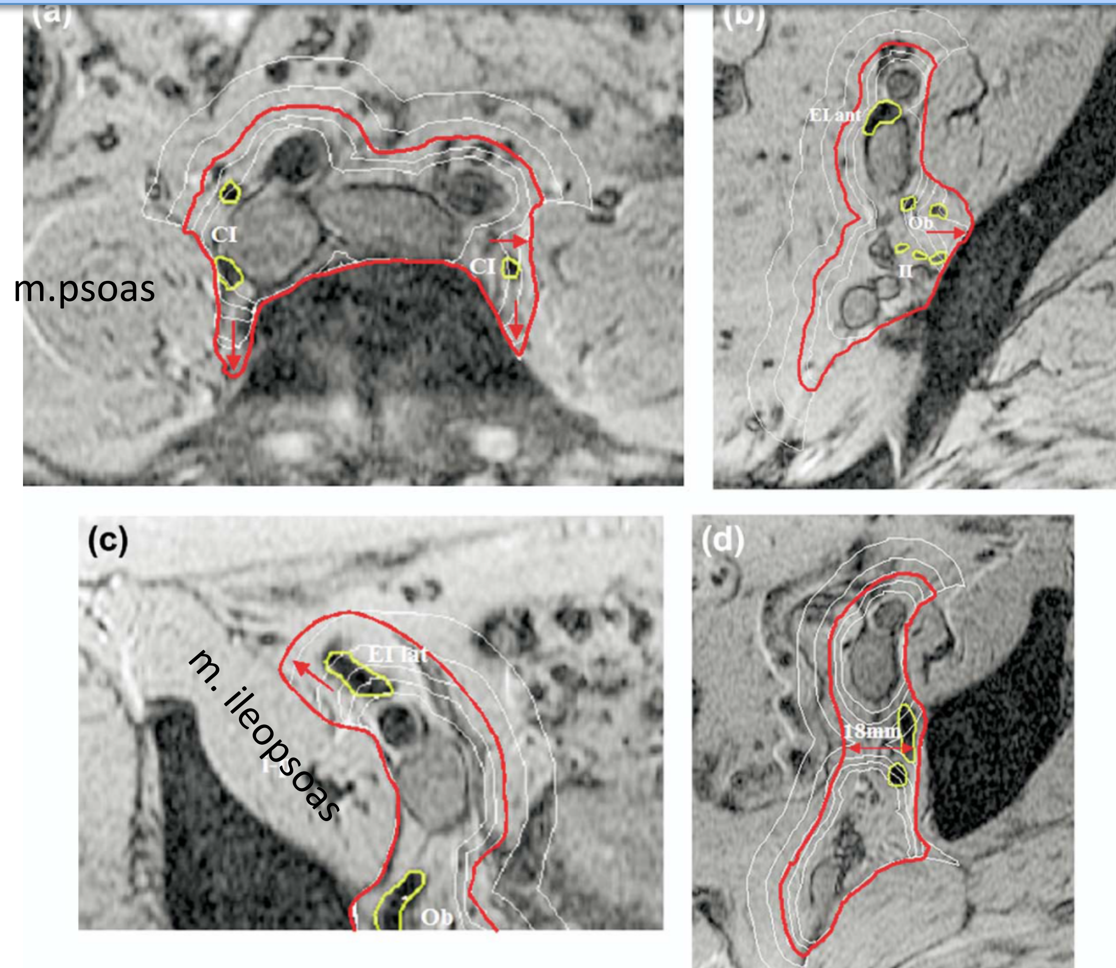
Table 4. Recommend modifications to margins

Lymph node group	Recommended margins*
Common iliac	7-mm margin around vessels; extend posterior and lateral borders to psoas and vertebral body
External iliac	7-mm margin around vessels; extend anterior border by additional 10-mm anterolaterally along iliopsoas muscle to include lateral external iliac nodes
Obturator	Join external and internal iliac regions with 18-mm-wide strip along pelvic sidewall
Internal iliac	7-mm margin around vessels; extend lateral borders to pelvic sidewall
Presacral	10-mm strip over anterior sacrum

* Also include any visible nodes.

A.Taylor, Int. J. Radiation Oncology Biol. Phys., Vol. 63, No. 5, pp. 1604–1612, 2005

DELINEAZIONE CTV LINFONODALE

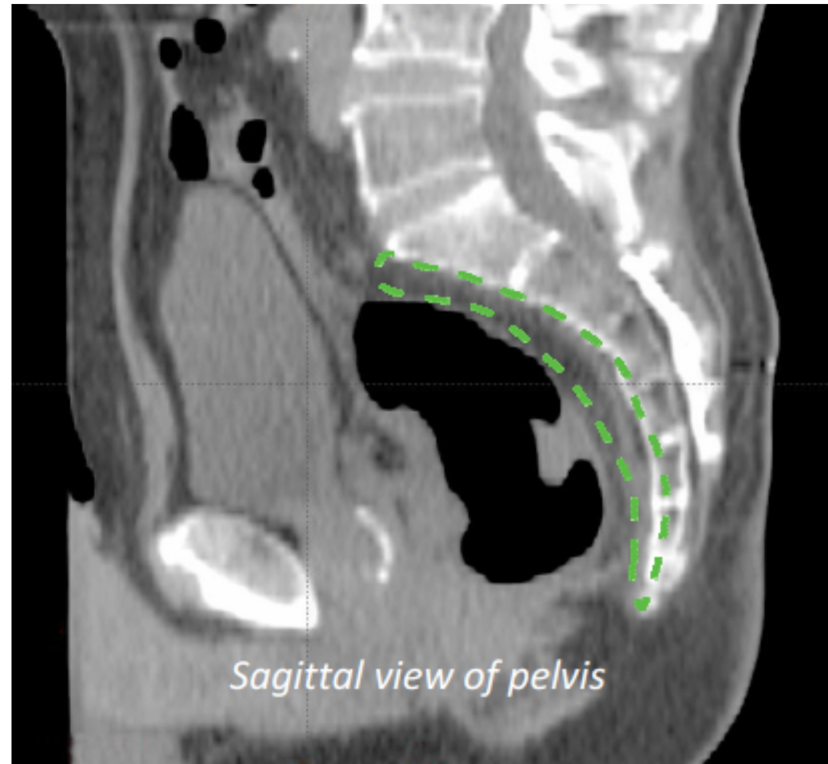


Escludere
-Anse
-Strutture muscolari
-Strutture ossee

Includere i linfonodi visibili

A.Taylor, Int. J. Radiation Oncology Biol. Phys., Vol. 63, No. 5, pp. 1604–1612, 2005

DELINEAZIONE CTV LINFONODALE

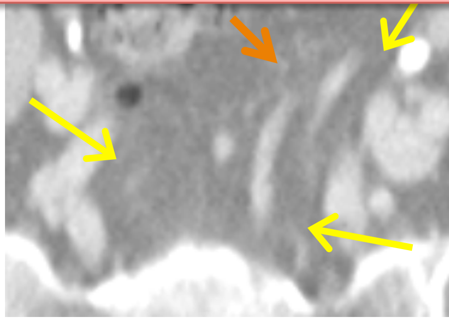


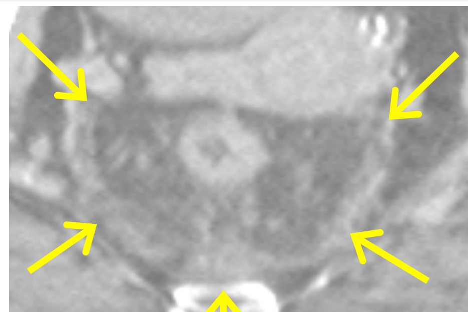
A.Taylor, Int. J. Radiation Oncology Biol. Phys., Vol. 63, No. 5, pp. 1604–1612, 2005

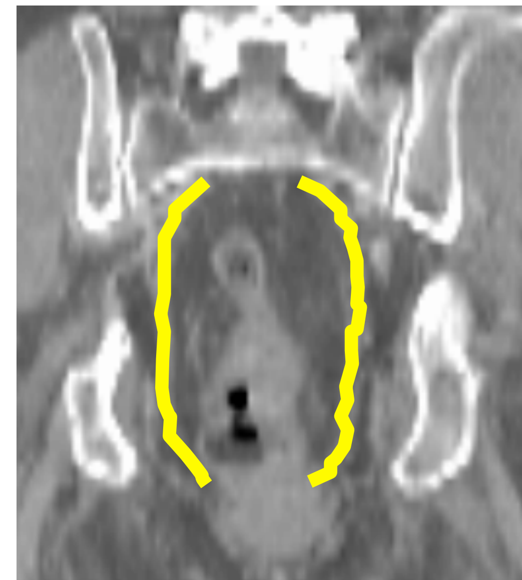
DELINEAZIONE CTV LINFONODALE

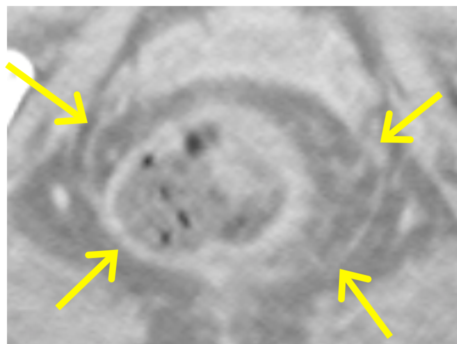
MESORETTO

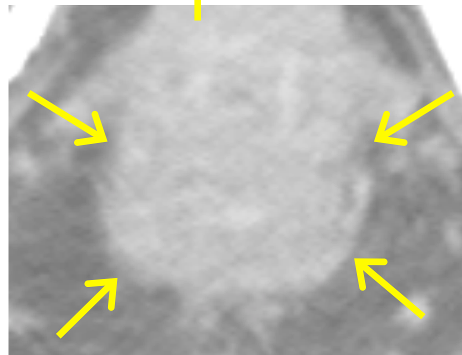
LIMITE SUPERIORE: alla biforcazione dell'arteria mesenterica inferiore nell'arteria sigmoidea e nell'arteria rettale superiore











M. Ng, T. Leong,. (AGITG) Int J Radiation Oncol Biol Phys, 83, 5, 1455-1462, 2012

S. Roels Int. J. Radiation Oncology Biol. Phys., Vol. 65, No. 4, pp. 1129–1142, 2006

DELINEAZIONE CTV LINFONODALE

Radiation Oncology
biology ● physics

www.redjournal.org

Clinical Investigation: Gastrointestinal Cancer

Australasian Gastrointestinal Trials Group (AGITG) Contouring Atlas and Planning Guidelines for Intensity-Modulated Radiotherapy in Anal Cancer

Michael Ng, M.B.B.S.(Hons), F.R.A.N.Z.C.R.,*
Trevor Leong, M.B.B.S., M.D., F.R.A.N.Z.C.R.,[†,‖]
Sarat Chander, M.B.B.S., F.R.A.N.Z.C.R.,[†] Julie Chu, M.B.B.S., F.R.A.N.Z.C.R.,[†]
Andrew Kneebone, M.B.B.S., F.R.A.N.Z.C.R.,[‡,**]
Susan Carroll, M.B.B.S., F.R.A.N.Z.C.R.,[§,**] Kirsty Wiltshire, M.B.B.S., F.R.A.N.Z.C.R.,[†]
Samuel Ngan, M.B.B.S., F.R.C.S.Ed., F.R.A.N.Z.C.R.,[†,‖] and Lisa Kachnic, M.D.[¶]

*Radiation Oncology Victoria, Victoria, Australia; [†]Department of Radiation Oncology, Peter MacCallum Cancer Centre, Victoria, Australia; [‡]Department of Radiation Oncology, Northern Sydney Cancer Centre, Royal North Shore Hospital, NSW, Australia; [§]Department of Radiation Oncology, Sydney Cancer Centre, Royal Prince Alfred Hospital, NSW, Australia; [¶]Department of Radiation Oncology, Boston Medical Center, Boston University School of Medicine, Boston, MA; [‖]University of Melbourne, Australia; and **University of Sydney, Australia

M. Ng, T. Leong, S. Chander et al. (AGITG) Int J Radiation Oncol Biol Phys, 83, 5, 1455-1462, 2012

DELINEAZIONE CTV LINFONODALE: PUNTI CRITICI

L. ILIACI ESTERNI – LIMITE CAUDALE: QUALE RIFERIMENTO SU TC ?

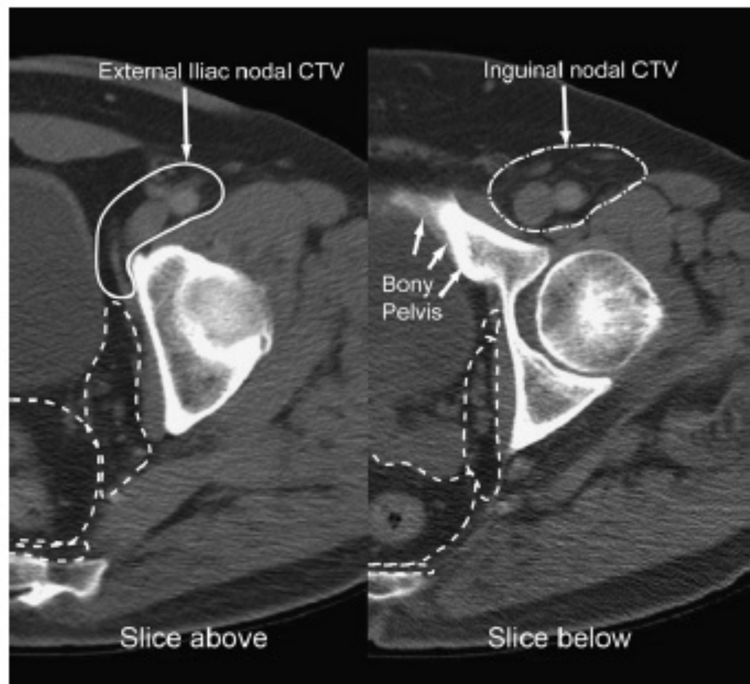


Fig. 2. Transition of external iliac clinical target volume (CTV) to inguinal CTV

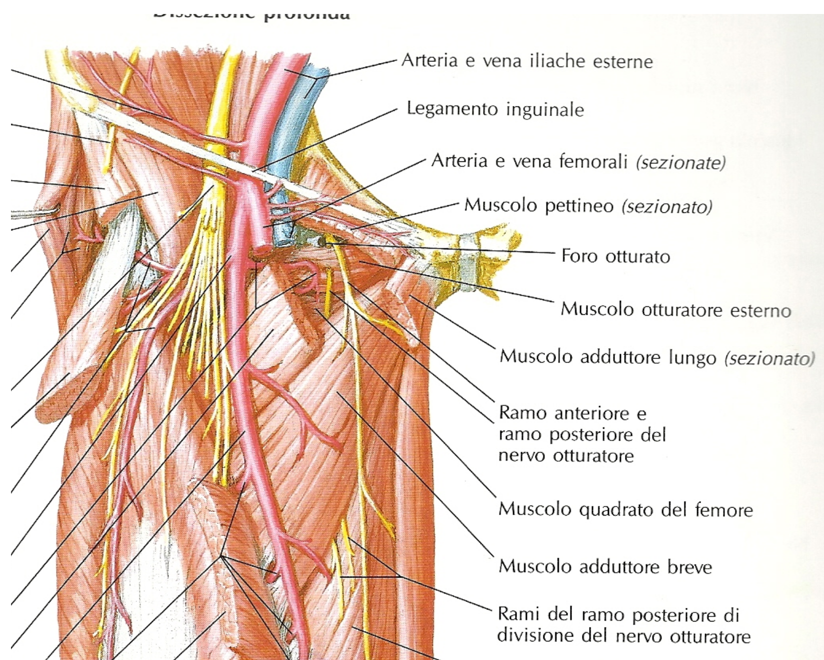
viene posto a livello del tetto acetabolare dove i vasi iliaci esterni diventano femorali;

questo passaggio usualmente viene individuato tra l'acetabolo ed il ramo superiore del pube;

M. Ng, T. Leong, S. Chander et al. (AGITG) Int J Radiation Oncol Biol Phys, 83, 5, 1455-1462, 2012

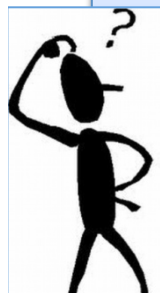
DELINEAZIONE CTV LINFONODALE: PUNTI CRITICI

L. INGUINALI – LIMITI



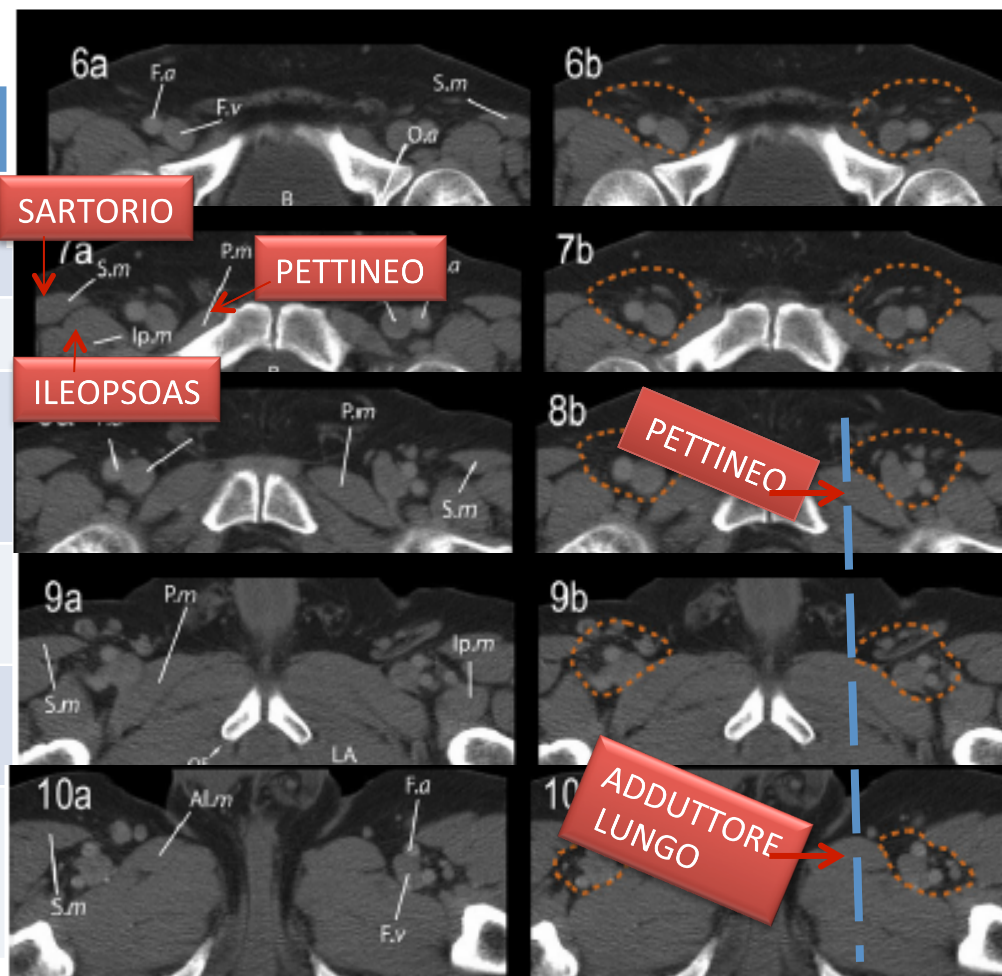
M. Ng, T. Leong, S. Chander et al. (AGITG) Int J Radiation Oncol Biol Phys, 83, 5, 1455-1462, 2012

DELINEAZIONE CTV LINFONODALE: PUNTI CRITICI



L. INGUINALI – LIMITI: QUALE RIFERIMENTO SU TC ?

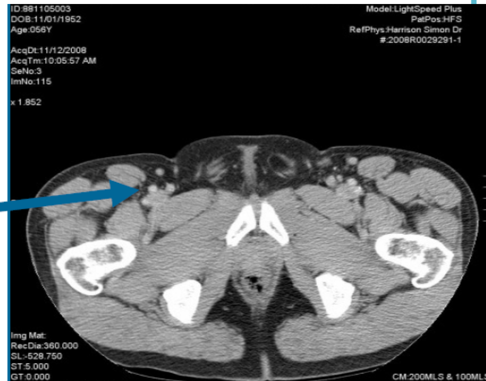
limite	
Craniale	Passaggio a. iliaca esterna - a. arteria femorale.
Caudale	da discutere
Anteriore	20 mm dai vasi femorali, fino a sotto il derma ed a comprendere ogni nodularità visibile
Posteriore	m. ileo psoas, pettineo ed adduttore lungo.
Laterale	margine mediale del sartorio e dell'ileopsoas
Mediale	10-20 mm dai vasi femorali seguendo il terzo mediale del m. pettineo o dell'adduttore lungo



M. Ng, T. Leong, S. Chander et al. (AGITG) Int J Radiation Oncol Biol Phys, 83, 5, 1455-1462, 2012

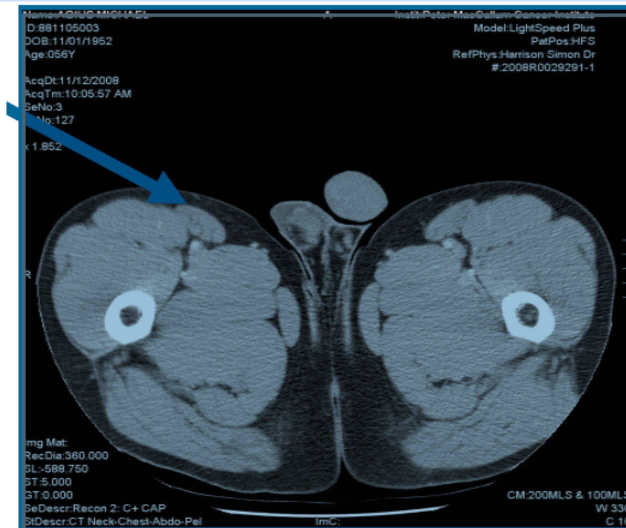
DELINEAZIONE CTV LINFONODALE: PUNTI CRITICI

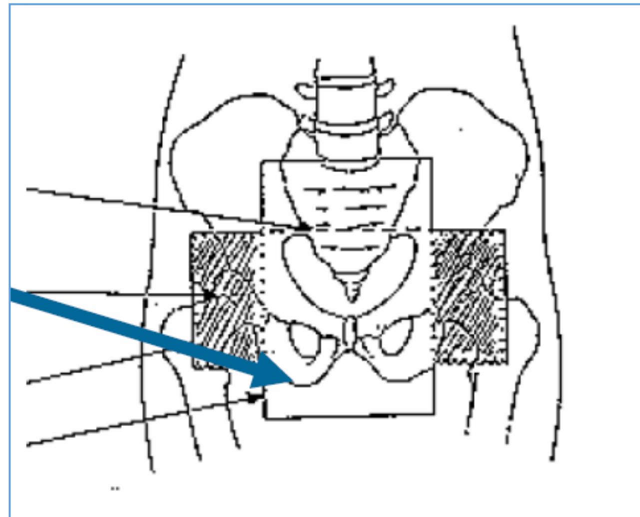
L. INGUINALI-LIMITE INFERIORE



punto in cui la vena safena entra nella vena femorale

incrocio tra il sartorio e l'adduttore lungo;



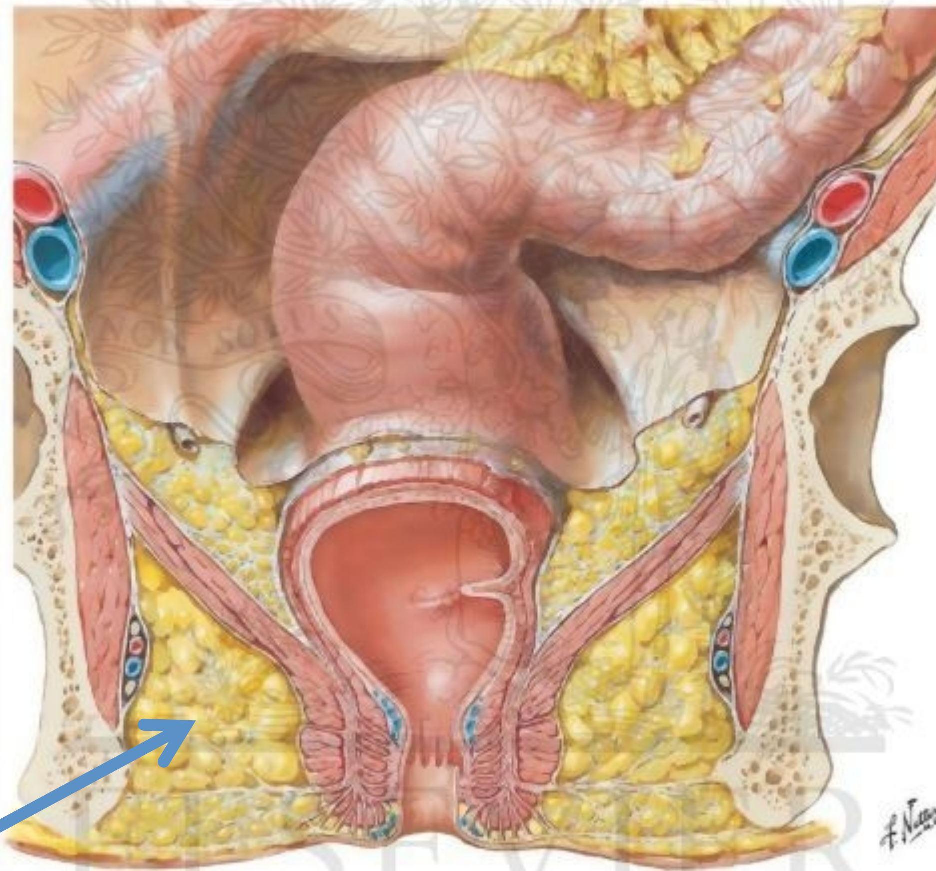


piano passante per
la tuberosità ischiatica + 2 CM CAUDALE.

M. Ng, T. Leong, S. Chander et al. (AGITG) Int J Radiation Oncol Biol Phys, 83, 5, 1455-1462, 2012

DELINEAZIONE CTV

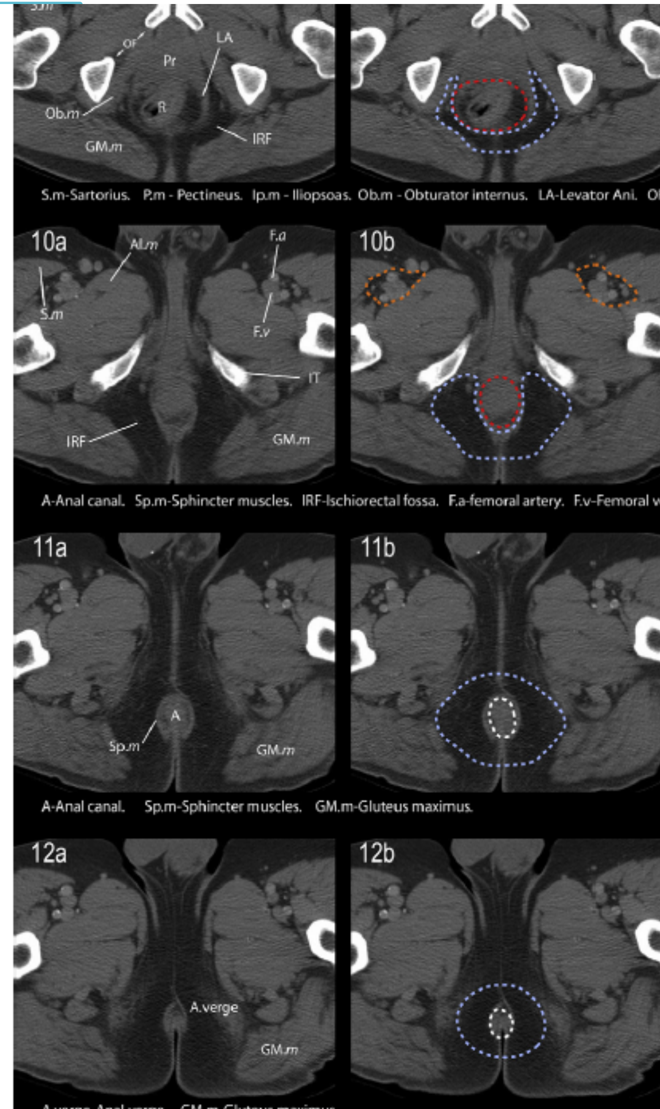
FOSSA ISCHIORETTALE



DELINEAZIONE CTV

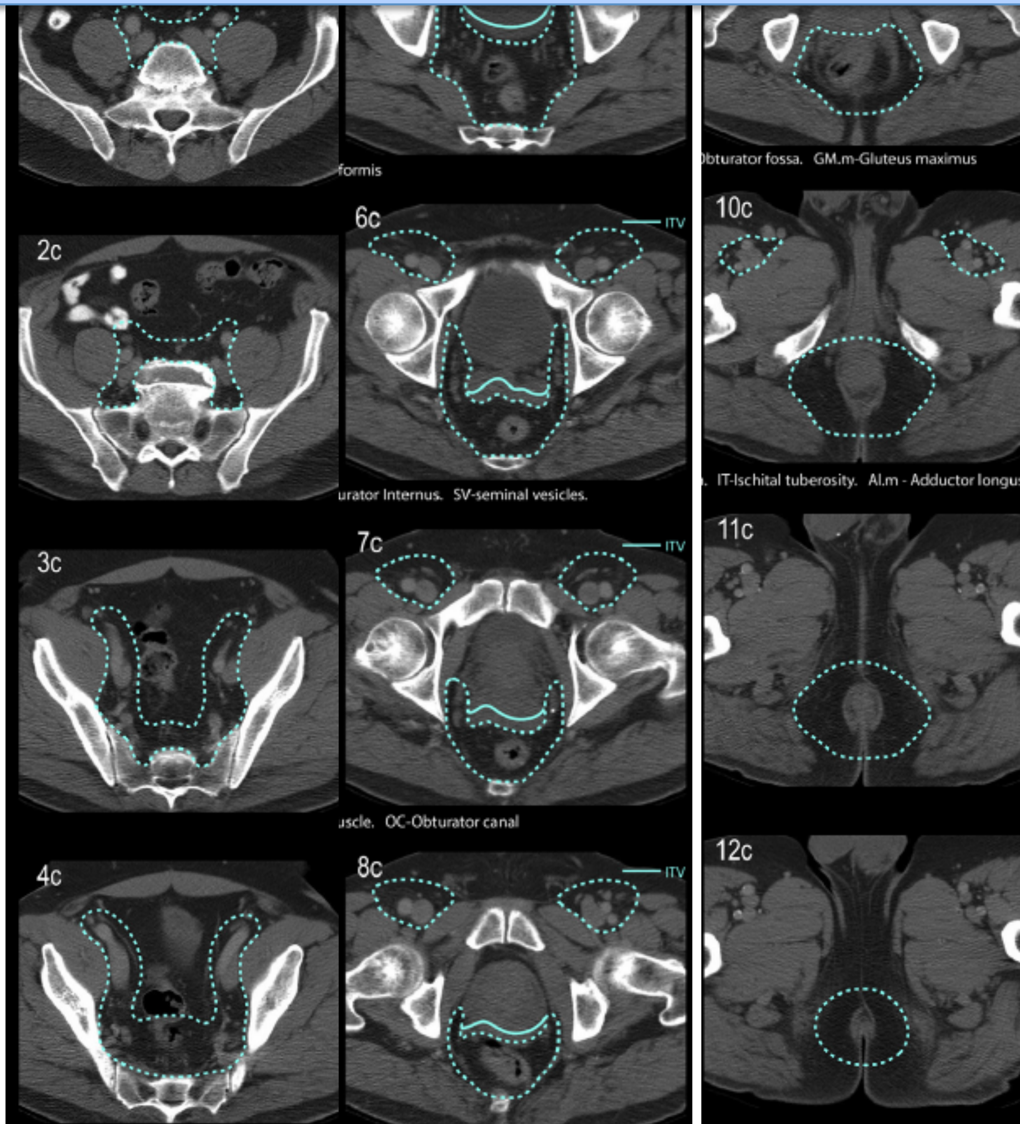
FOSSA ISCHIORETTALE

limite	
Craniale	m. elevatore dell'ano, il grande gluteo e l'otturatorio interno
Caudale	sul piano dell'orifizio anale esterno
Anteriore	alla linea di fusione del m.otturatorio interno con il m. elevatore dell'ano e lo sfintere
Posteriore	dal piano che unisce la porzione più anteriore della parete mediale dei grandi glutei
Laterale	segue la tuberosità ischiatica, il muscolo otturatorio interno ed il grande gluteo
Mediale	



M. Ng, T. Leong, S. Chander et al. (AGITG) Int J Radiation Oncol Biol Phys, 83, 5, 1455-1462, 2012

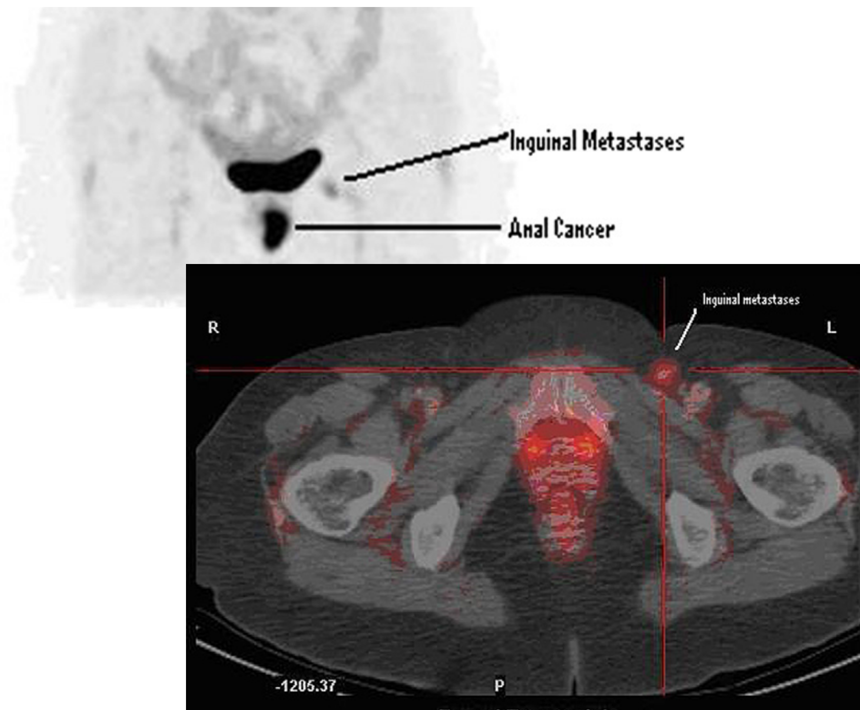
DELINEAZIONE CTV



M. Ng, T. Leong, S. Chander et al. (AGITG) Int J Radiation Oncol Biol Phys, 83, 5, 1455-1462, 2012

DELINEAZIONE GTV T ed N

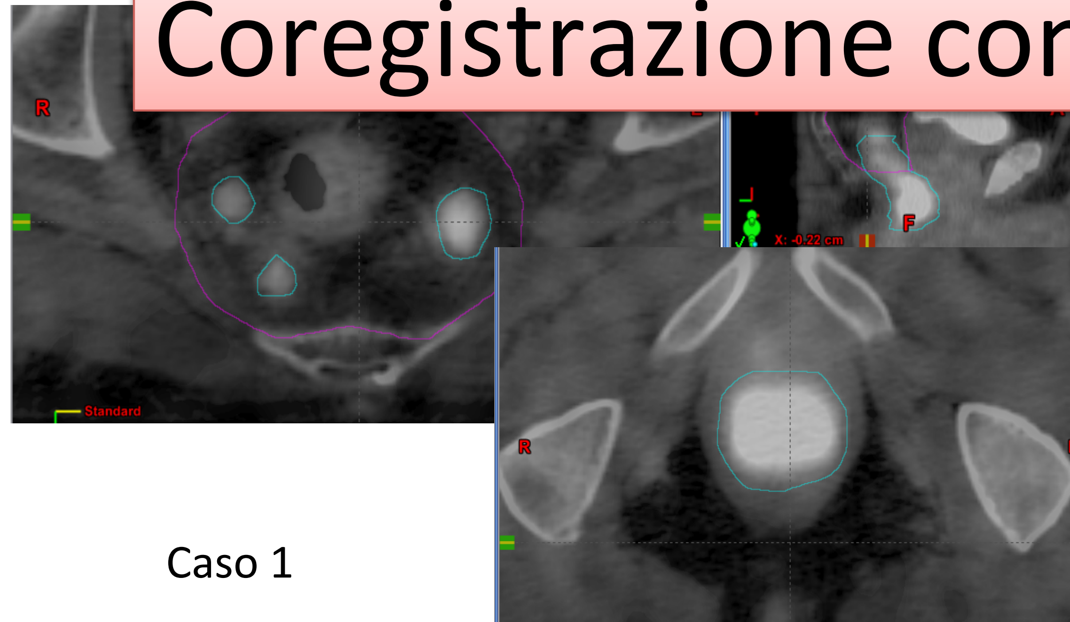
Il **GTV sia di T che di N** deve essere delineato come struttura separata, tenendo conto dell'obiettività clinica e dell'imaging disponibile.



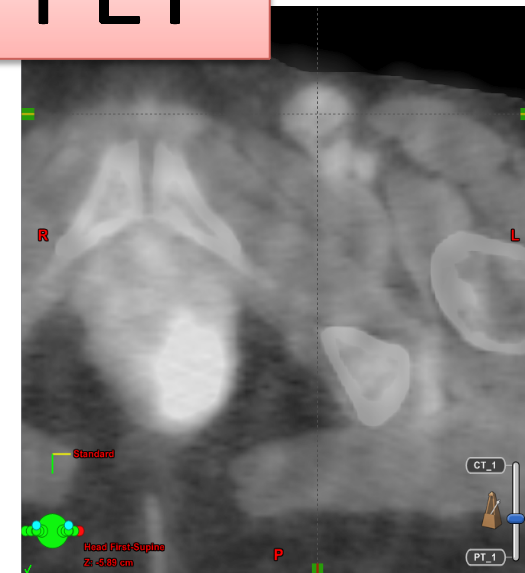
La CT/PET, anche se ancora non riportata nelle linee guida come esame raccomandato, ha assunto un ruolo fondamentale nell'individuazione del GTV

P. Bannas, Int. J. Radiation Oncology Biol. Phys., Vol. 81, 2, 445–451, 2011
M. Mistrangelo et al. Int J Radiation Oncol Biol Phys, Vol. 84, 1, 66e 72, 2012
J. Sveistrup, Int J Radiation Oncol Biol Phys, Vol. 83, 1, 134e141, 2012.

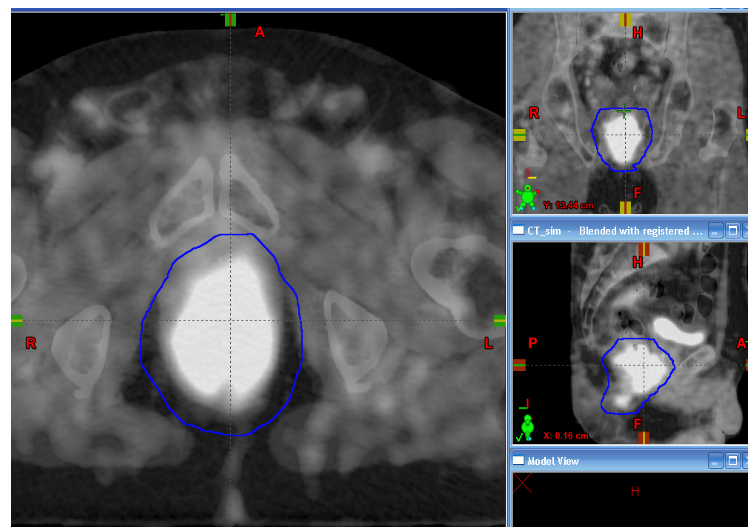
Coregistrazione con CT PET



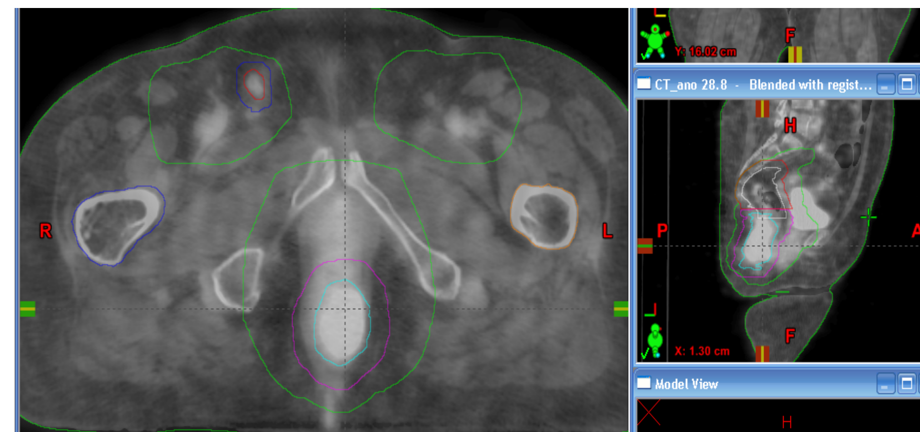
Caso 1



Caso 2



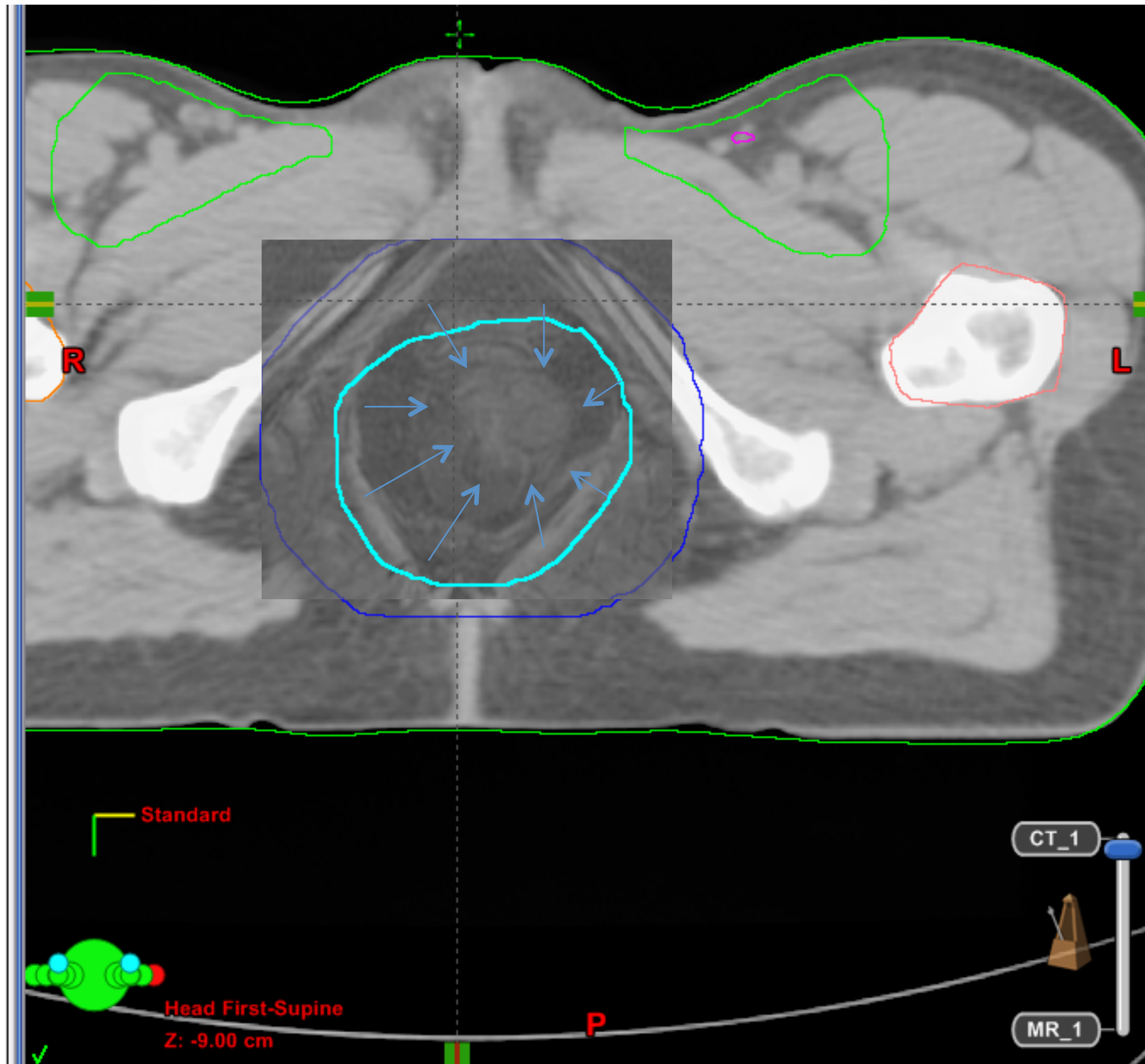
Caso 3



Caso 4

OSPEDALI RIUNITI

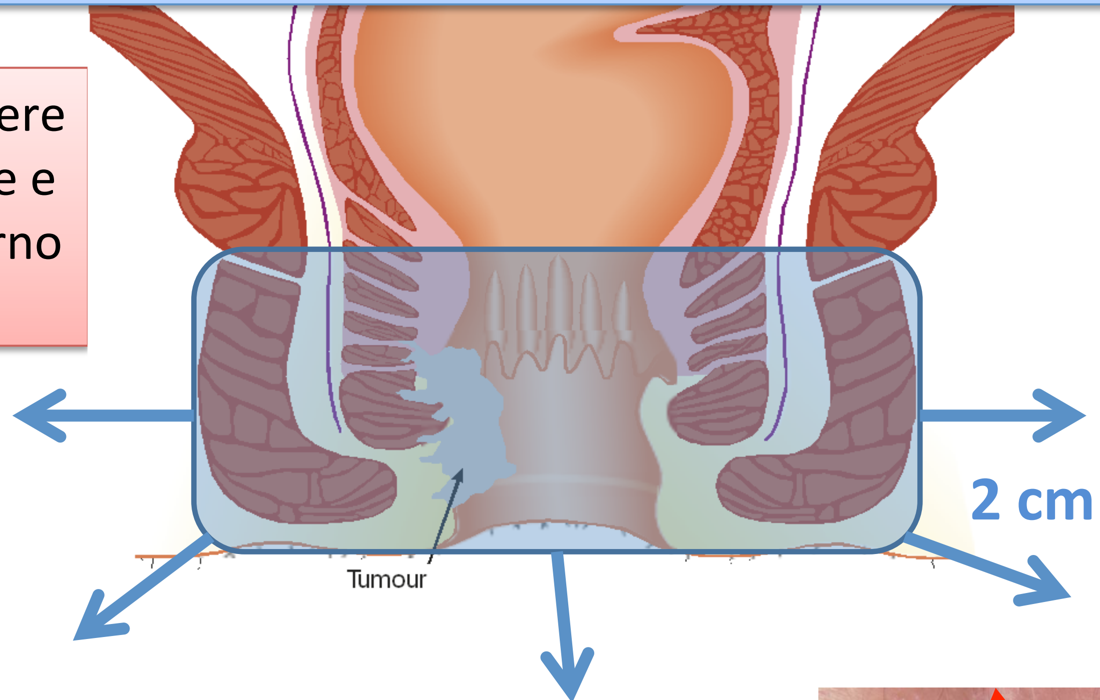
Coregistrazione con RM

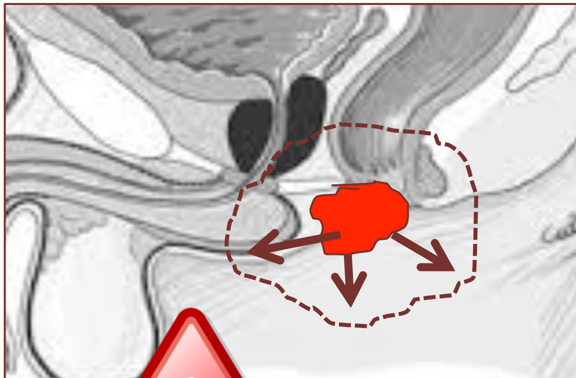


Azienda Ospedaliero Universitaria
OSPEDALI RIUNITI
Umberto I - G.M.Lancisi - G.Salesi
Ancona

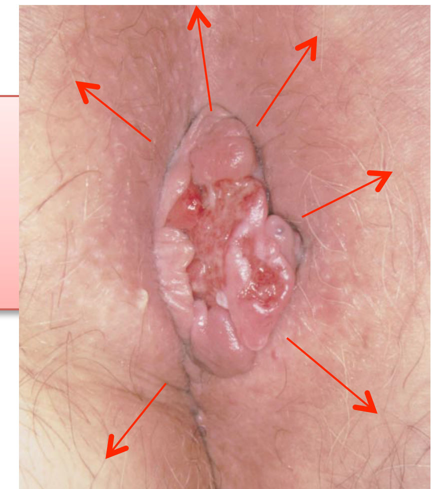
DELINEAZIONE CTV T

Il **CTV di T** deve comprendere il GTV, l'intero canale anale e lo sfintere interno ed esterno con 2 cm di margine.





attenzione anal verge ed infiltrazione perianale → margine di almeno 2 cm, anche caudalmente.



PRIORITA' COPERTURA CTV RISPETTO A CONSTRAINTS SU GENITALI

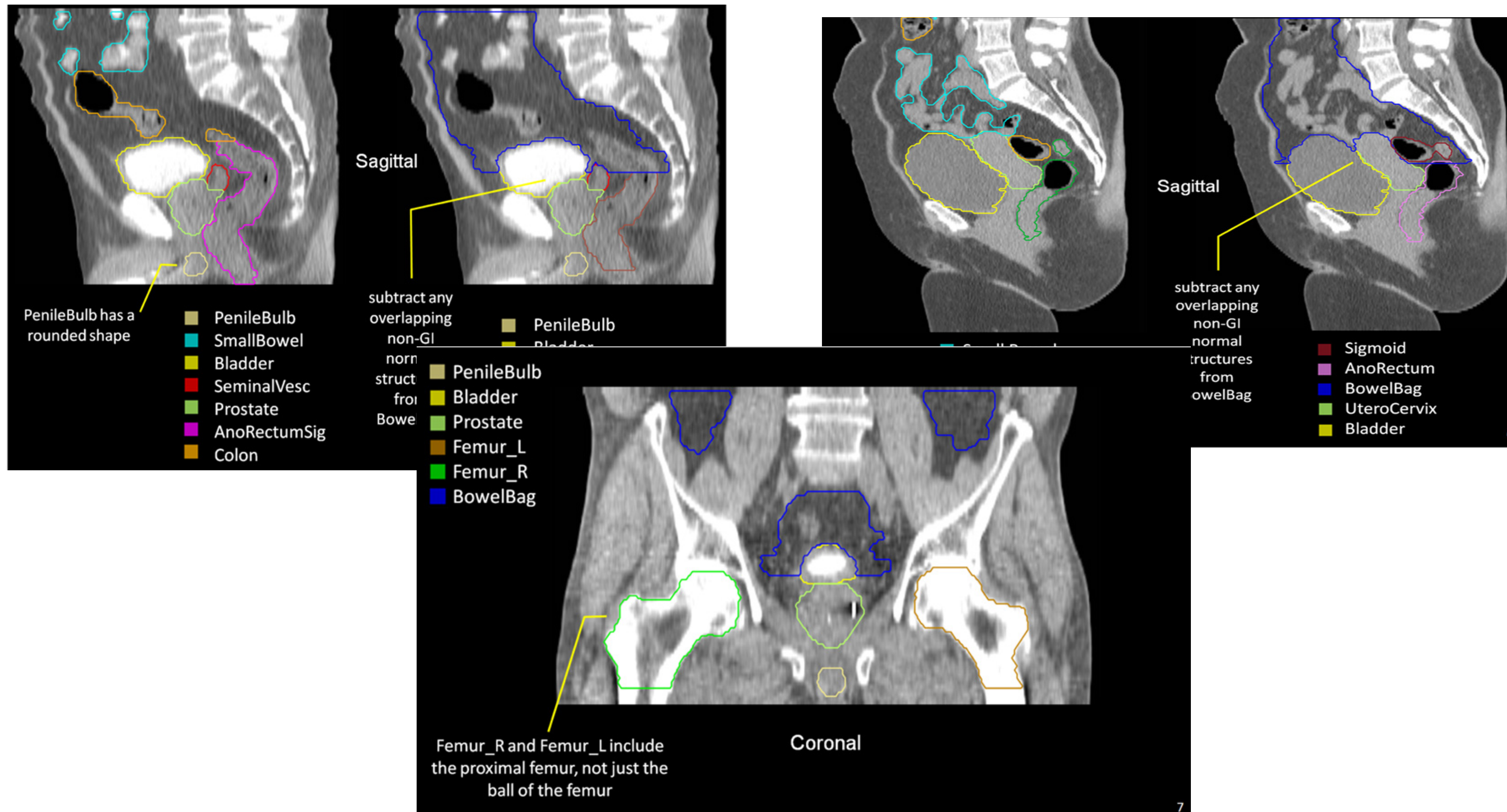
M. Ng, T. Leong, S. Chander et al. (AGITG) Int J Radiation Oncol Biol Phys, 83, 5, 1455-1462, 2012

DELINEAZIONE CTV di N+

Il **CTV di N+** deve comprendere il GTV di N con un margine di 1-2 cm, rispettando le barriere anatomiche.

M. Ng, T. Leong, S. Chander et al. (AGITG) Int J Radiation Oncol Biol Phys, 83, 5, 1455-1462, 2012

DELINEAZIONE OARs



H. A. Gay RTOG . Int J Radiation Oncol Biol Phys, Vol. 83, 3, e353-e362, 2012
QUANTEC Int. J. Radiation Oncology Biol. Phys., Vol. 76,.3, Supplement, 2010
C. Fiorino Radiotherapy and Oncology, 93, 153–167, 2009

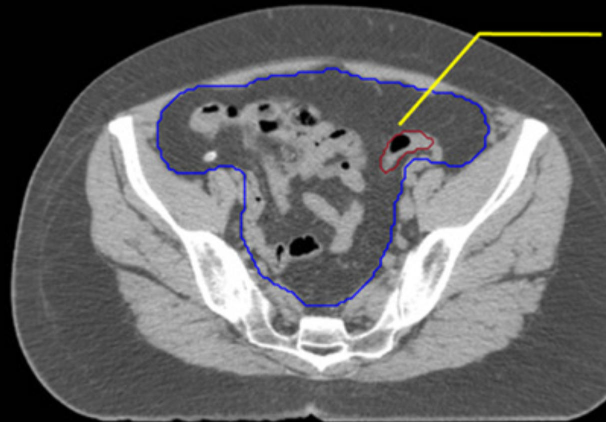
DELINEAZIONE OARs

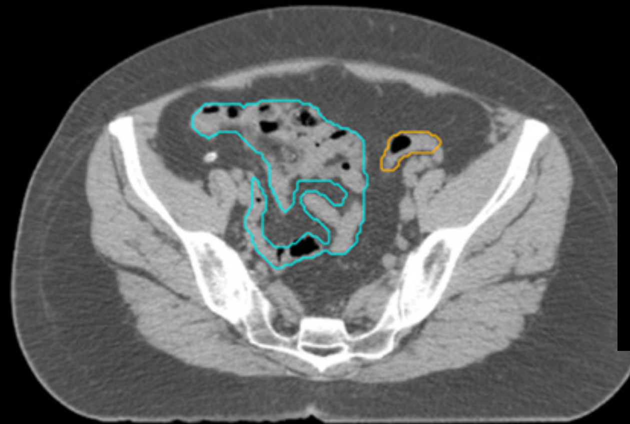
GYN:
- Sigmoid
- AnoRectum
- BowelBag

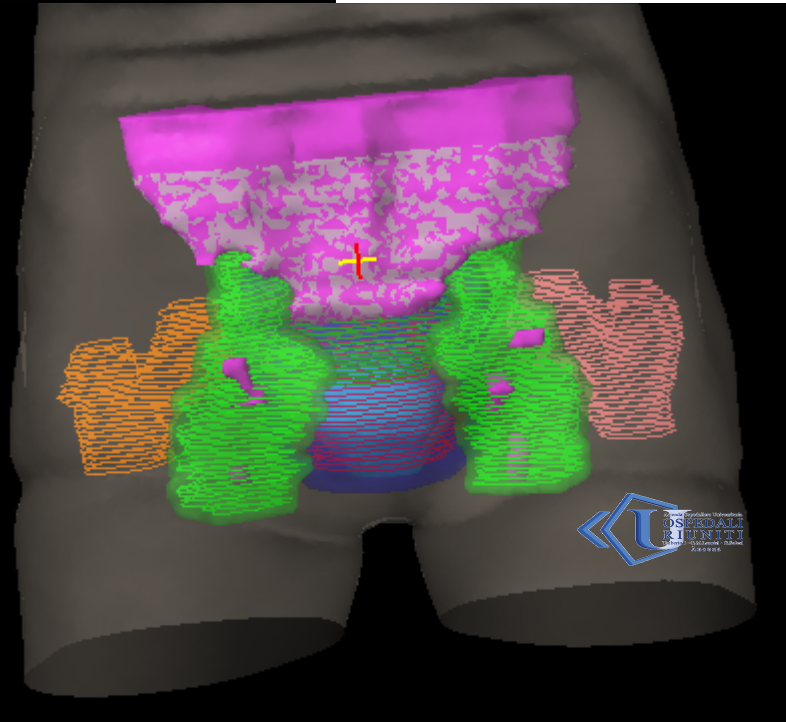
GYN/GI:
- UteroCervix
- Femur_L
- Femur_R
- Adnexa_R
- Adnexa_L
- Bladder

GI:
- Small Bowel
- AnoRectumSig
- Colon

Stop contouring Sigmoid prior to connecting to the ascending colon laterally







76

H. A. Gay RTOG . Int J Radiation Oncol Biol Phys, Vol. 83, 3, e353-e362, 2012
QUANTEC Int. J. Radiation Oncology Biol. Phys., Vol. 76,.3, Supplement, 2010
C. Fiorino Radiotherapy and Oncology, 93, 153–167, 2009

TAKE HOME MESSAGES

PRESCRIZIONE DEI VOLUMI CLINICI

Clinical target volumes for gross disease

Primary tumor

- GTV: The GTV should be delineated as a separate structure based on all available clinical and imaging information.
- CTV: This volume must encompass (*1*) the GTV, (*2*) the entire anal canal from the ano-rectal junction to the anal verge, and (*3*) the internal and external anal sphincters. A further 20-mm isotropic margin should be added to items (*1*), (*2*), and (*3*) above, to account for microscopic disease, while respecting anatomical boundaries. Attention must be given, especially for anal verge and perianal lesions, that a 20-mm radial and caudal margin is used to ensure coverage of perianal skin.

CTV T

CTV N+

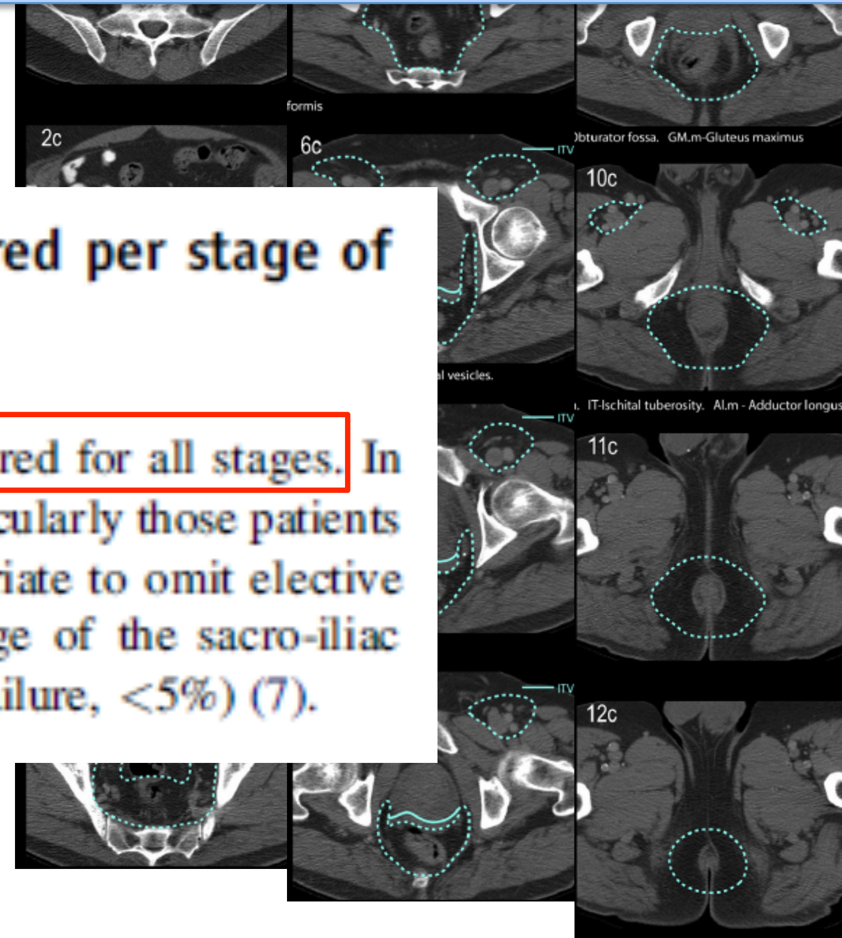
Involved nodes

- GTV: The involved node(s).
- CTV: The involved node(s) or nodal region(s) with a 10- to 20-mm margin, respecting anatomical boundaries.

M. Ng, T. Leong, S. Chander et al. (AGITG) Int J Radiation Oncol Biol Phys, 83, 5, 1455-1462, 2012

TAKE HOME MESSAGES

PRESCRIZIONE DEI VOLUMI CLINICI



Elective nodal volumes to be covered per stage of disease

All nodal volumes described should be covered for all stages. In patients with select early T1N0 cancers, particularly those patients with major comorbidities, it may be appropriate to omit elective nodal irradiation superior to the caudal edge of the sacro-iliac joints, and the inguinal nodes (low risk of failure, <5%) (7).

CTV N-

M. Ng, T. Leong, S. Chander et al. (AGITG) Int J Radiation Oncol Biol Phys, 83, 5, 1455-1462, 2012

TAKE HOME MESSAGES

MODULAZIONE DEI VOLUMI CLINICI

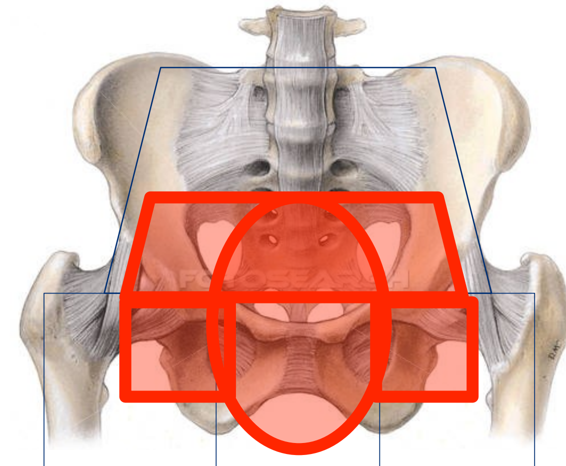
TAKE HOME MESSAGES

MODULAZIONE DEL CTV

T1N0
Paziente anziano comorbidita'

Elective nodal volumes to be covered per stage of disease

All nodal volumes described should be covered for all stages. In patients with select early T1N0 cancers, particularly those patients with major comorbidities, it may be appropriate to omit elective nodal irradiation superior to the caudal edge of the sacro-iliac joints, and the inguinal nodes (low risk of failure, <5%) (7).



M. Ng, T. Leong, S. Chander et al. (AGITG) Int J Radiation Oncol Biol Phys, 83, 5, 1455-1462, 2012

TAKE HOME MESSAGES

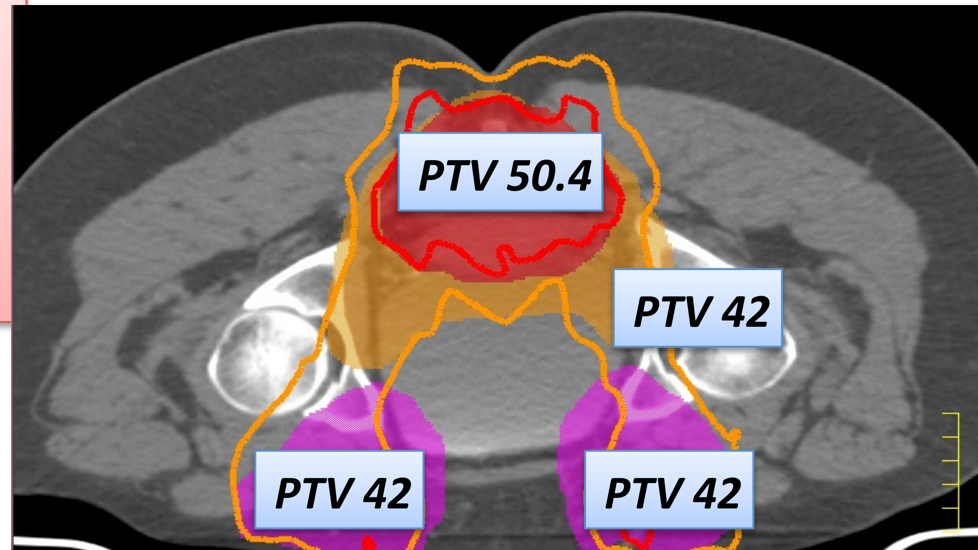
MODULAZIONE DEI VOLUMI DI DOSE

RTOG 0529

T2/N0

CTV T= 50.4 Gy (180 fr)
CTV N- (elective nodes) = 42 Gy (150 fr)

in 28 fxs over 5.5 weeks



L. Kachnic, Int J Radiation Oncol Biol Phys, Vol. 86, No. 1, pp. 27e33, 2013

TAKE HOME MESSAGES

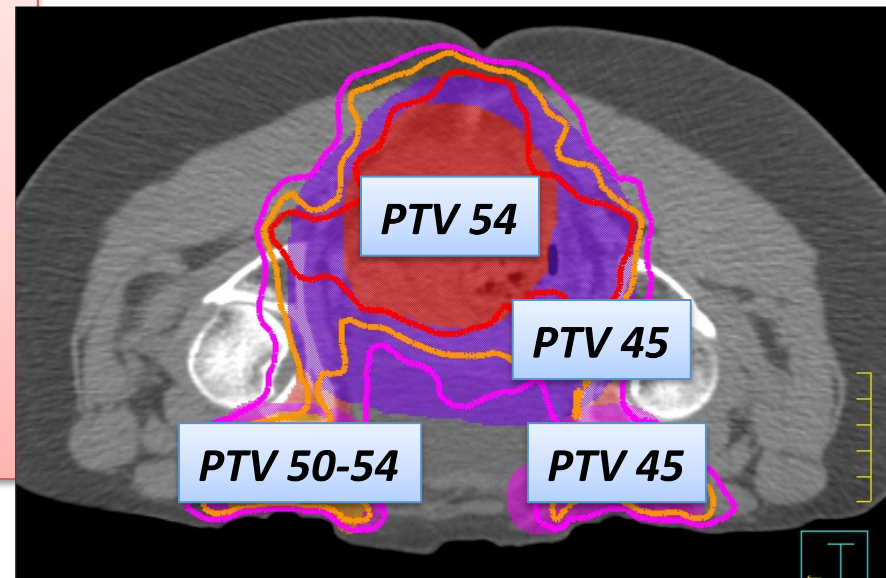
MODULAZIONE DEI VOLUMI DI DOSE

RTOG 0529

T3 – T4

CTV T = 54 Gy (180 fr)
CTV N- (elective nodes) = 45 Gy (150 fr)
CTV N+< 3 cm = 50.4 Gy (168 fr)
CTV N+> 3 cm = 54 Gy (180 fr)

in 30 fxs over 6 weeks



L. Kachnic, Int J Radiation Oncol Biol Phys, Vol. 86, No. 1, pp. 27e33, 2013