SERVIZIO SANITARIO REGIONALE
EMILIA-ROMAGNA
Azienda Ospedaliero - Universitaria di Ferrara

università di ferrara
DA SEICENTO ANNI GUARDIAMO AVANTI.

Società Medico Chirurgica di Ferrara

LE ALTERAZIONI FUNZIONALI DEL COMPLESSO VESCICO-SFINTERIALE DOPO CHIRURGIA DEMOLITIVA PELVICA

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(Direttore: Prof. A. Liboni)

Chirurgia demolitiva pelvica

Isterectomia radicale
Cistectomia radicale
Prostatectomia radicale
Resezione del retto
Exenteratio pelvis
Peritonectomia

Chirurgia demolitiva pelvica

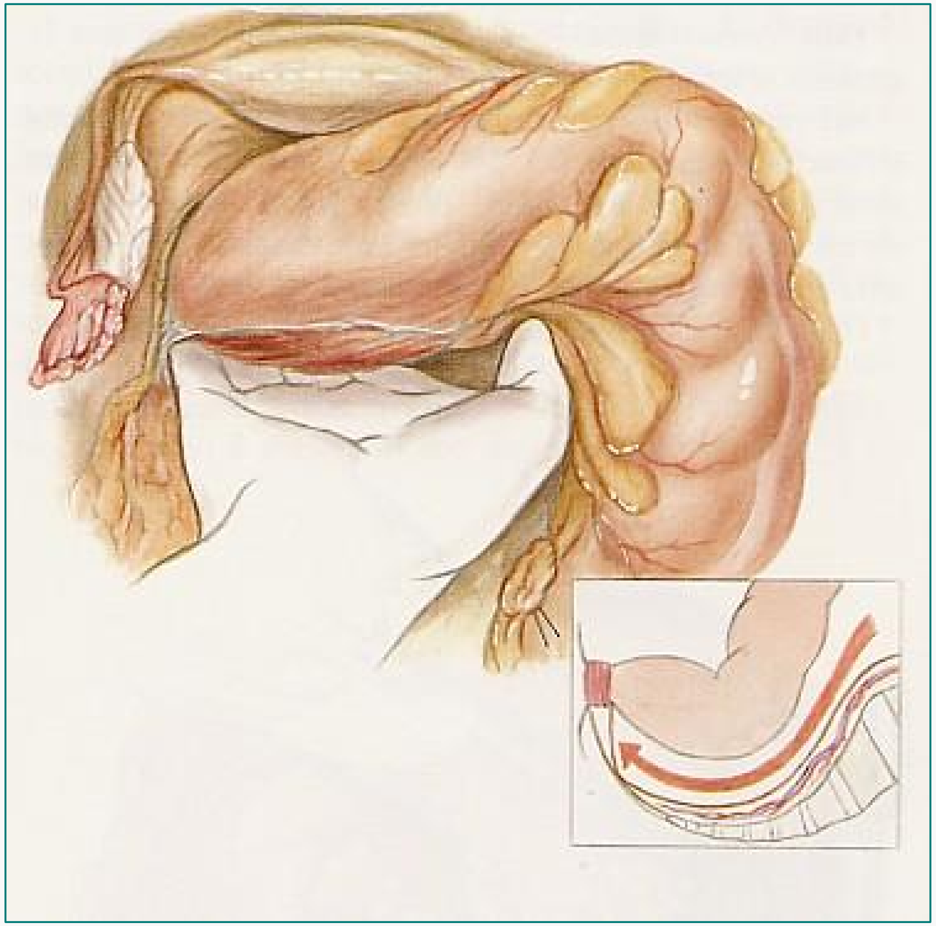
Cura della neoplasia
-controllo locale
-aumento della sopravvivenza

Assenza di complicanze intra e post-operatorie, a breve e lungo termine

Preservazione delle funzioni:
-urinaria
-sessuale
-anale e rettale

Chirurgia demolitiva pelvica

Il passato: *blind hand dissection*



Disfunzioni post-operatorie:

-urinarie

-sessuali

-ano-rettali

Chirurgia demolitiva pelvica

Il presente: chirurgia *nerve-sparing*

NERVE-SPARING

Preservazione dei nervi autonomici pelvici

Isterectomia radicale nerve-sparing
Cistectomia radicale nerve-sparing
Prostatectomia radicale nerve-sparing
Resezione del retto nerve-sparing (Total Mesorectal Excision)

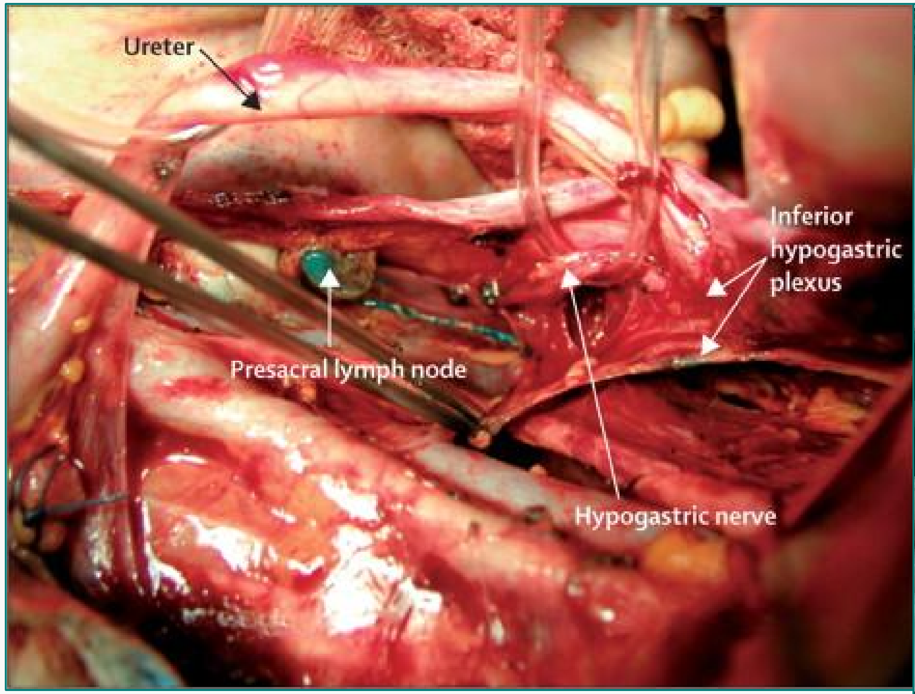
Chirugia demoltiva pelvica
Risultati funzionali

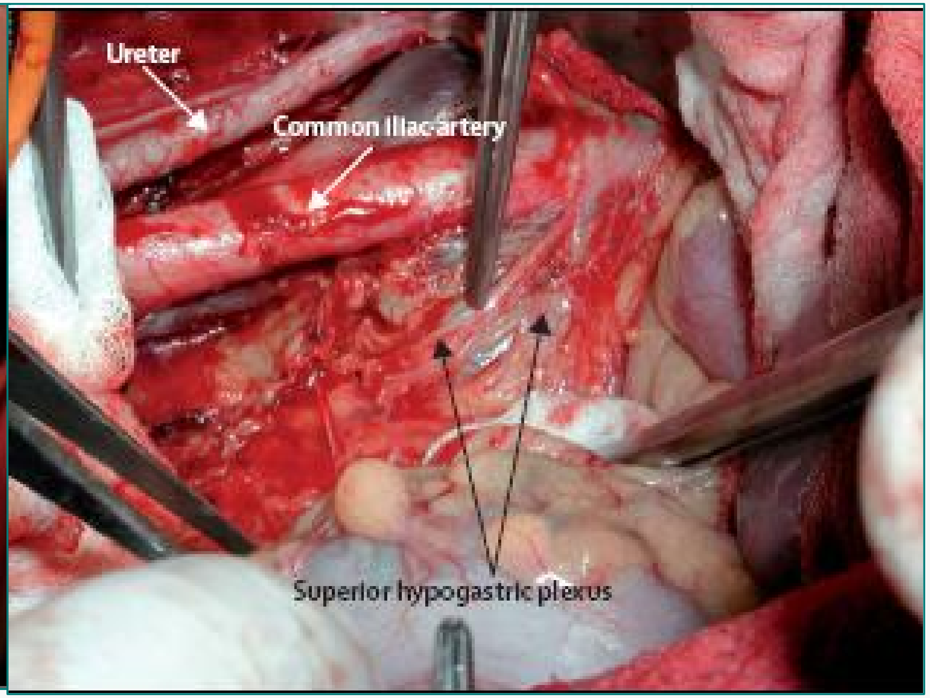
Hojo K et al. Preservation of urine voiding and sexual function after rectal cancer surgery. Dis Colon Rectum 1991.
Walsh PC et al. Radical prostectomy and cystoprostatectomy with preservation of potency. Results using a new nerve-sparing technique. Br J Urol 1984.

	No Nerve-sparing	Nerve-sparing
Disfunzioni vescico-sfinteriali	7-89%	5-76 %
Disfunzioni sessuali	39-100%	0-50%
Disfunzioni ano-rettali	10-55%	3-40%

Sistema nervoso autonomo della pelvi

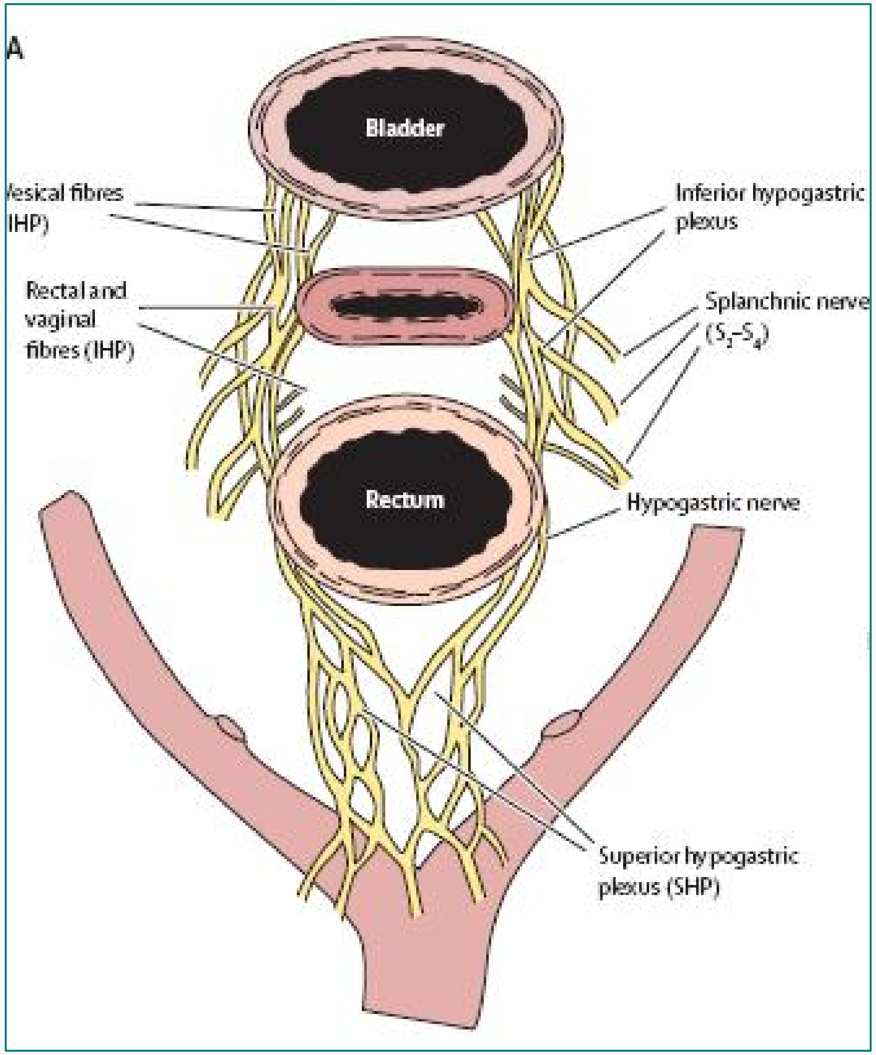
Pelvic neuro-anatomy





Pelvic neuro-anatomy

Baader B. Topography of the pelvic autonomic nervous system and its potential impact on surgical intervention in the pelvis. Clinical anatomy 2003.



Catena simpatica para-aortica T11-L2

↓

Ganglio mesenterico superiore

↓

Plesso ipogastrico superiore

↙

Nervi ipogastrici → N splancnici (pelvici)

↘ ↙

Plesso ipogastrico inferiore (pelvico)

↓

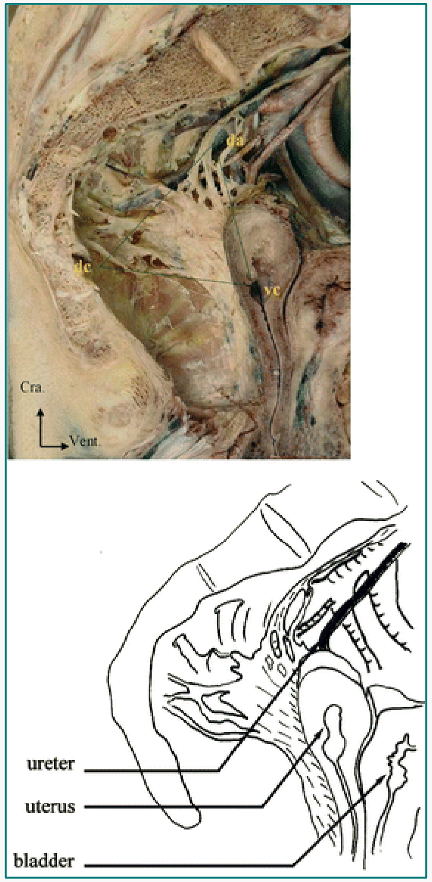
Fibre post-ganglioniche

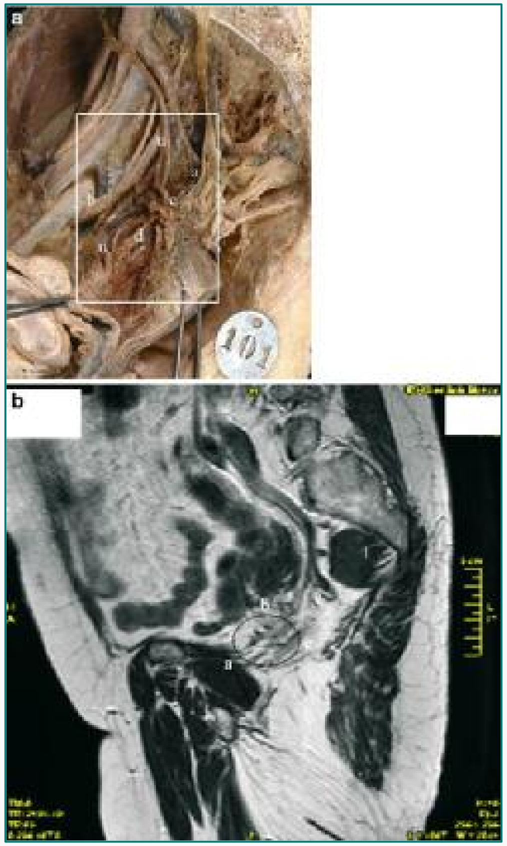
↙ ↓ ↘ ↘

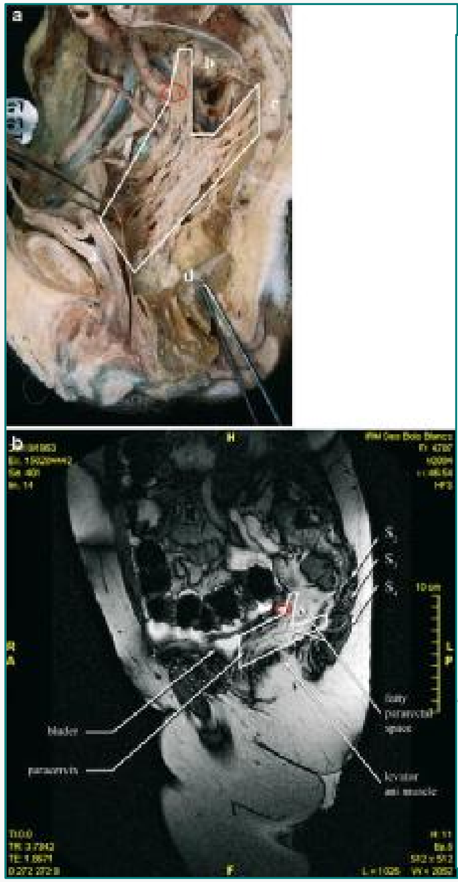
vescica | cervice | vagina | retto

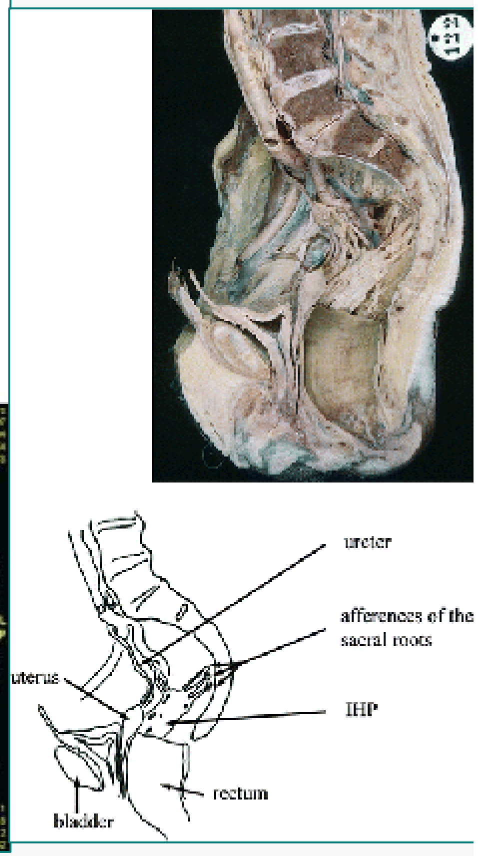
Sistema nervoso autonomo della pelvi

Mauroy B et al. The female inferior hypogastric (pelvic) plexus: anatomical and radiological description of the plexus and its afferences-applications to pelvic surgery. Surg Radiol Anat 2007



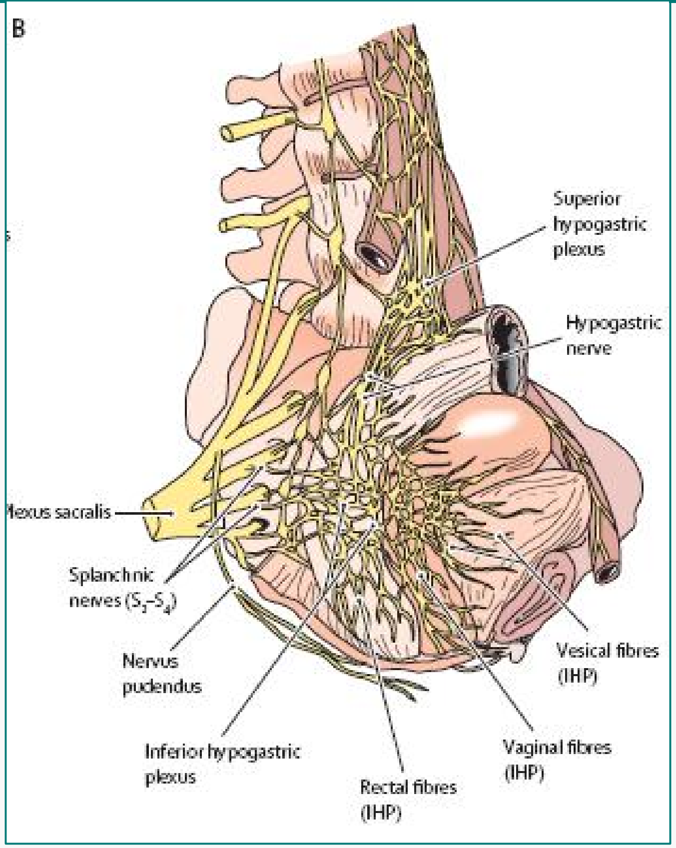


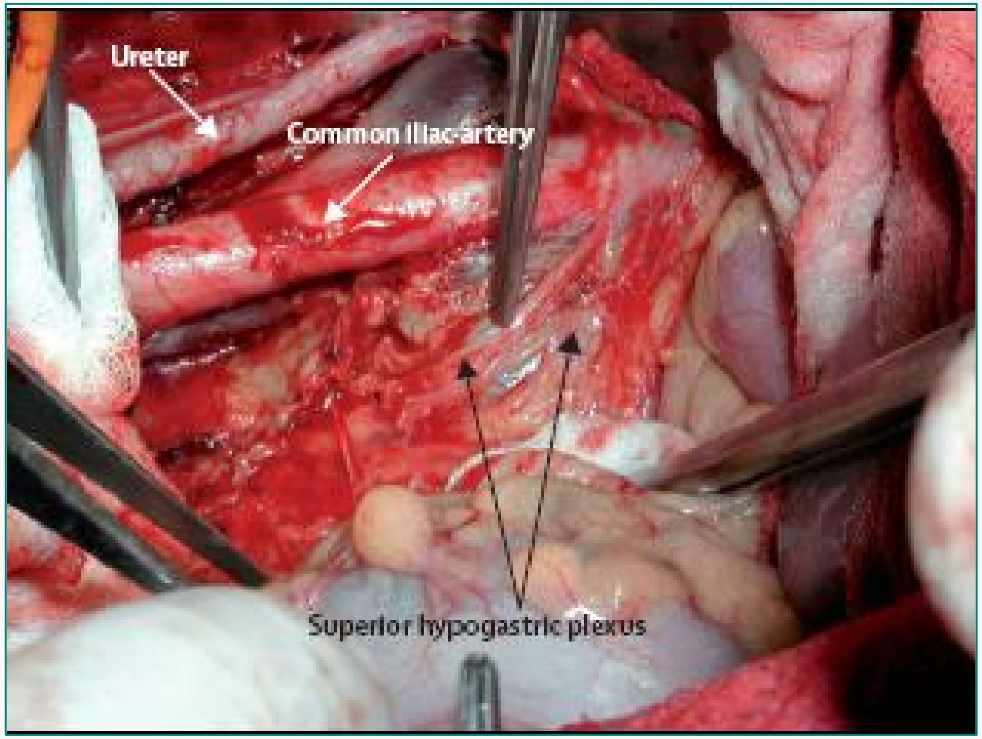




Il plesso ipogastrico superiore

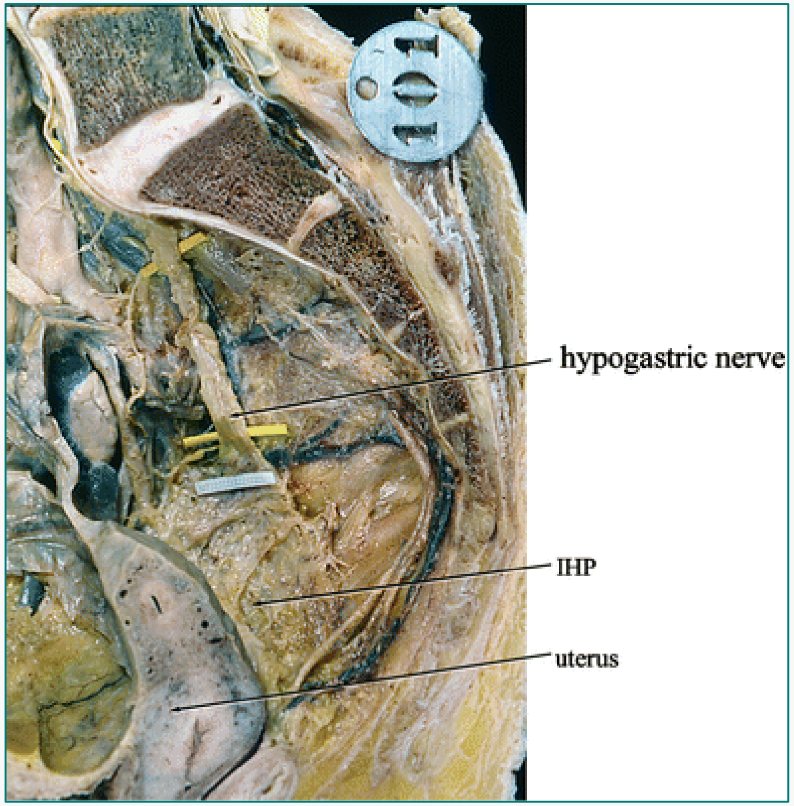
Rob L et al. Nerve-sparing and individually tailored surgery for cervical cancer. Lancet Oncol 2010

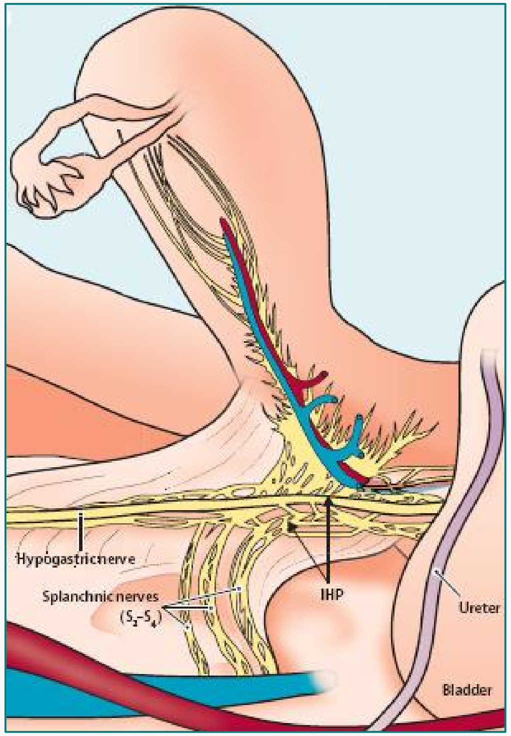


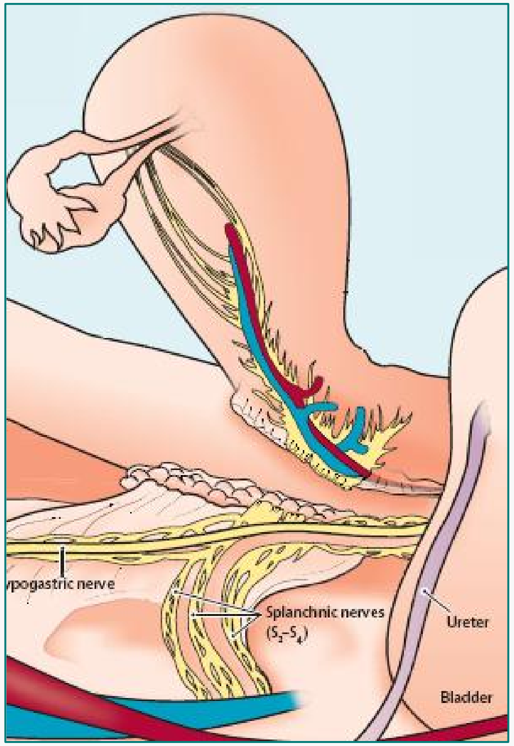


I nervi ipogastrici

Baader B. Topography of the pelvic autonomic nervous system and its potential impact on surgical intervention in the pelvis. Clinical anatomy 2003. Rob L et al. Nerve-sparing and individually tailored surgery for cervical cancer. Lancet Oncol 2010

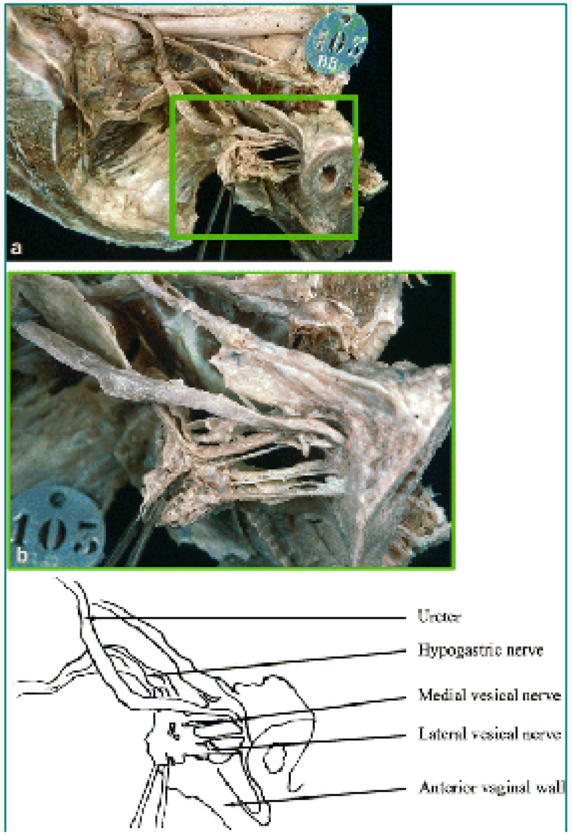


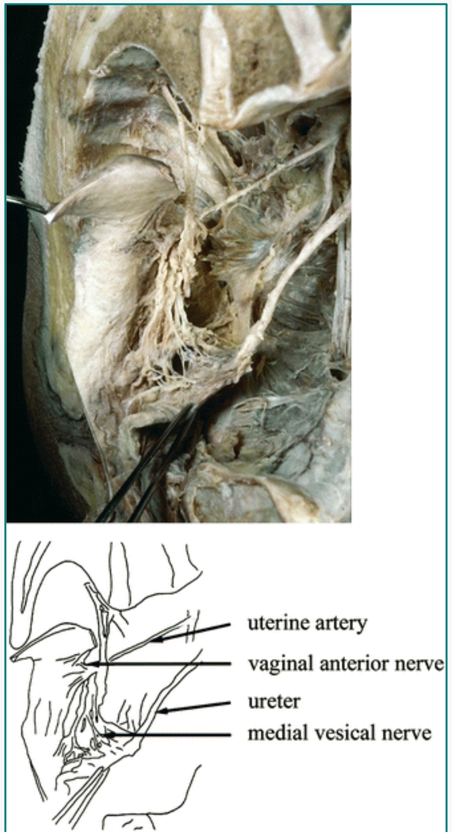


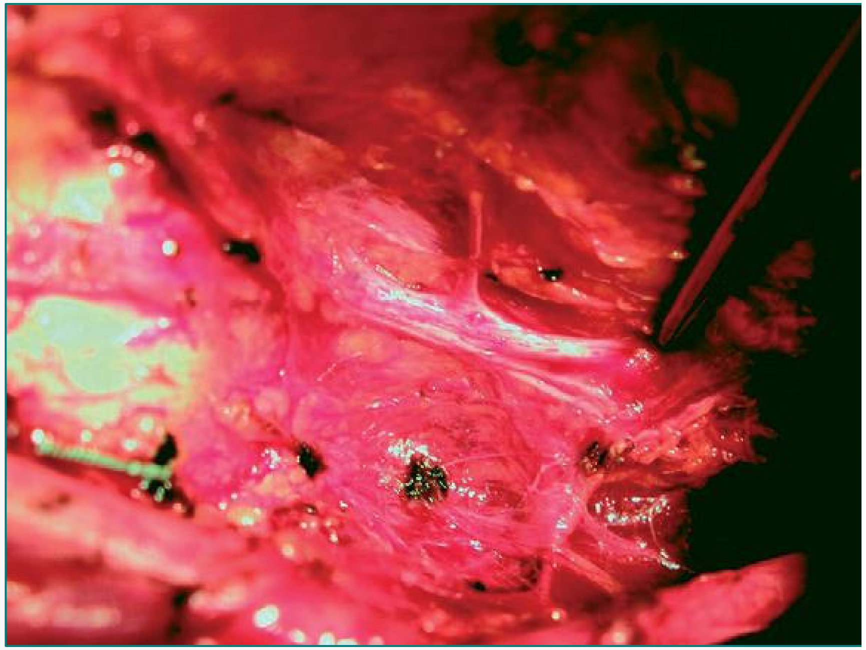


Il plesso ipogastrico Inferiore (o pelvico)

Mauroy B et al. The female inferior hypogastric (pelvis) plexus: anatomical and radiological description of the plexus and its afferences- application to pelvic surgery. Surg Radiol Anat 2007.

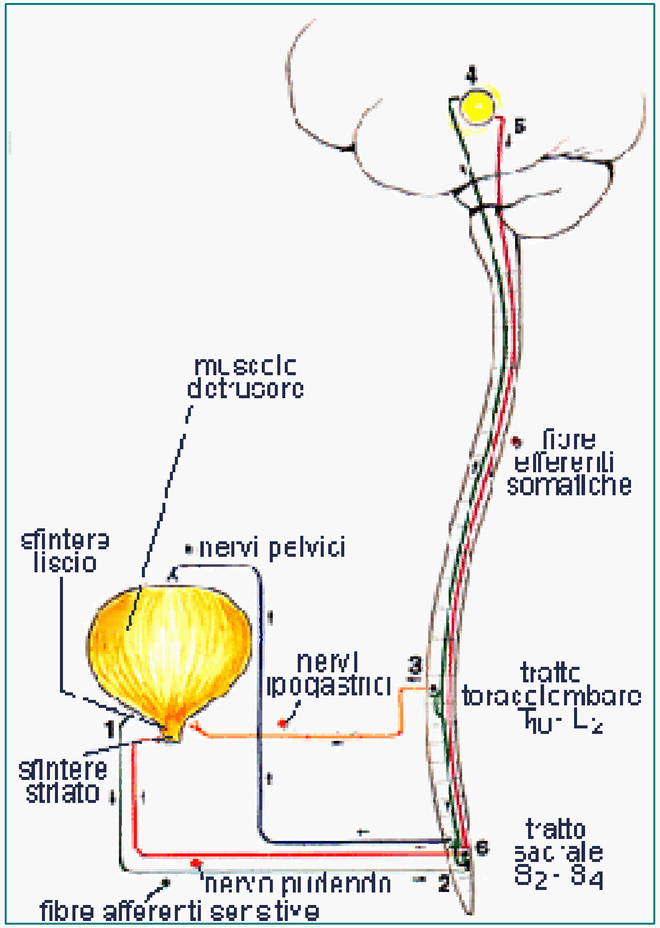




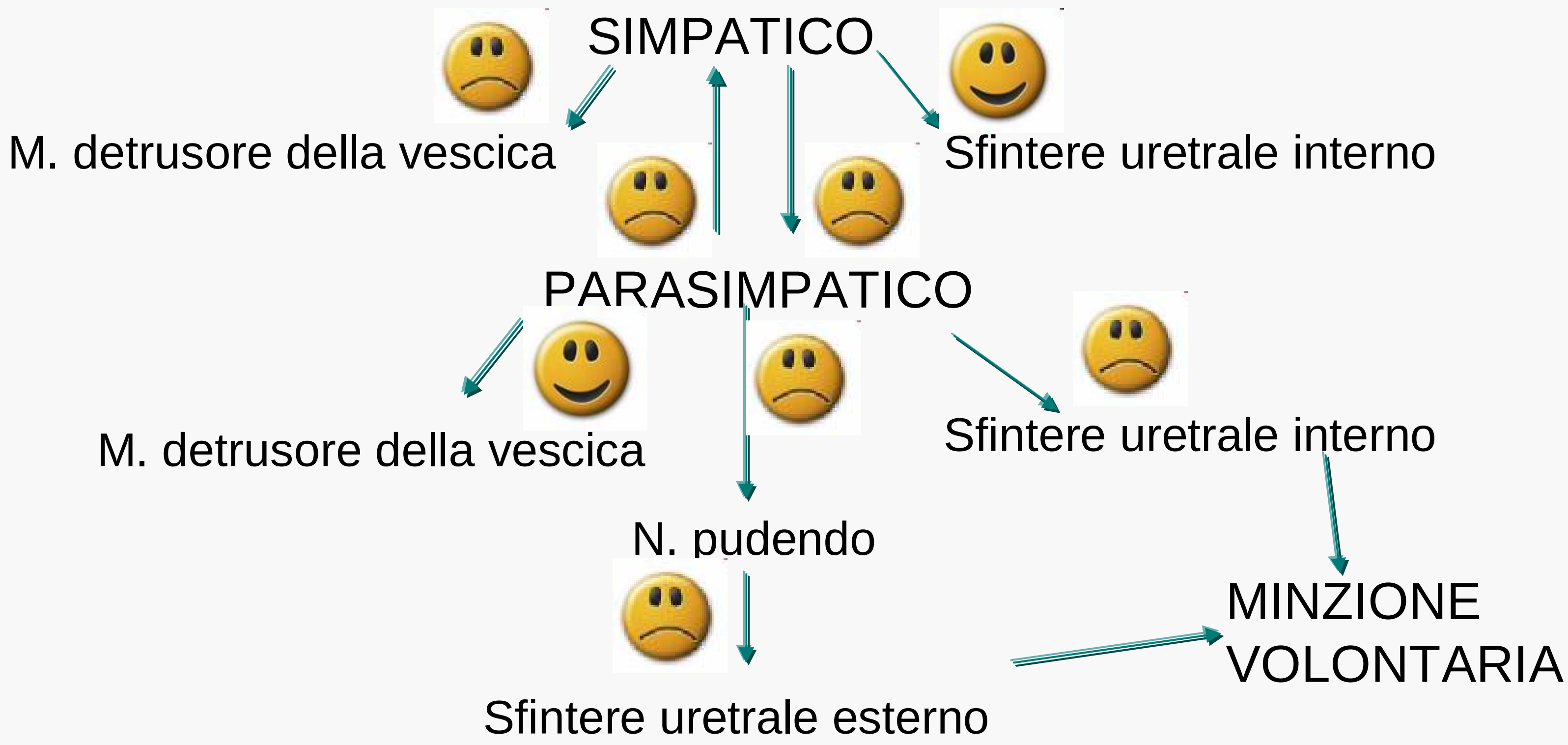


SNA pelvi

Funzione urinaria



SNA pelvi
Funzione urinaria



Chirurgia demolitiva pelvica
Disfunzioni vescicali

Zullo MA et al. Vesical dysfunctions after radical hysterectomy for cervical cancer: a critical review. Crit Rew in Oncol Hematol 2003

Perdita del controllo simpatico

Ipertonia del m.detrusore

Ridotta compliance vescicale

Trauma dell'intervento

Catetere prolungato

Vescica iperattiva (ipertonica)

Vescica ipotonica

Aumento del controllo parasimpatico

Inibizione del collo vescicale e dell'uretra pross.

Incontinenza urinaria

Chirurgia demolitiva pelvica
Disfunzioni vescicali

Zullo MA et al. Vesical dysfunctions after radical hysterectomy for cervical cancer: a critical review. Crit Rew in Oncol Hematol 2003

Lesioni dei n. ipogastrici → Alterata sensibilità vescicale

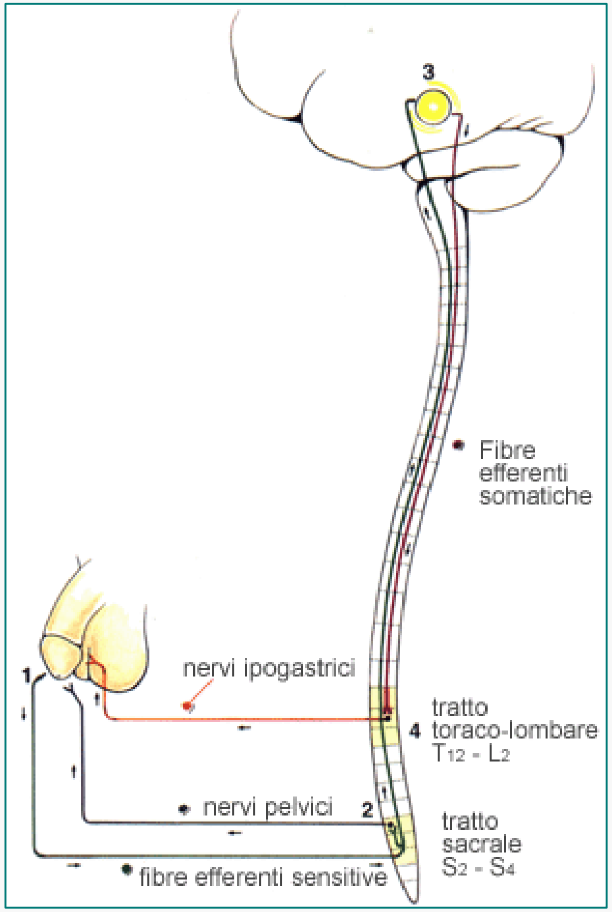
Lesioni del plesso ipogastrico inferiore → Ritenzione urinaria

Lesioni del plesso ipogastrico inferiore → Incontinenza urinaria

Lesioni dei n. pelvici e n. pudendo → Perdita del tono muscolare periuretrale

Perdita del tono muscolare periuretrale → Incontinenza urinaria

SNA pelvi
Funzione sessuale



SIMPATICO: Chiusura del collo vescicale, contrazione delle vescicole seminali, dei dotti deferenti e della prostata (eiaculazione).
Contrazione muscolatura liscia dei vasi e del tessuto erettile

PARASIMPATICO: n.erigentes
Vasodilatazione e aumento del flusso sanguigno art. (erezione)

N. PUDENDO: efferenze somatiche motorie (apertura sfintere striato dell'uretra e contrazione dei m. bulbo e ischio-cavernosi nell'eiaculazione)

SNA pelvi
Funzione sessuale ♂

Havenga K et al. Avoiding long-term disturbance to bladder and sexual function in pelvic surgery, particularly with rectal cancer. Sem Surg Oncol 2000.

Lesioni al plesso ipogastrico superiore → Disfunzioni dell'eiaculazione

Lesioni del plesso ipogastrico inferiore → Disfunzione erettile

Lesione del fascio neurovascolare (n.erigentes) → Disfunzione erettile

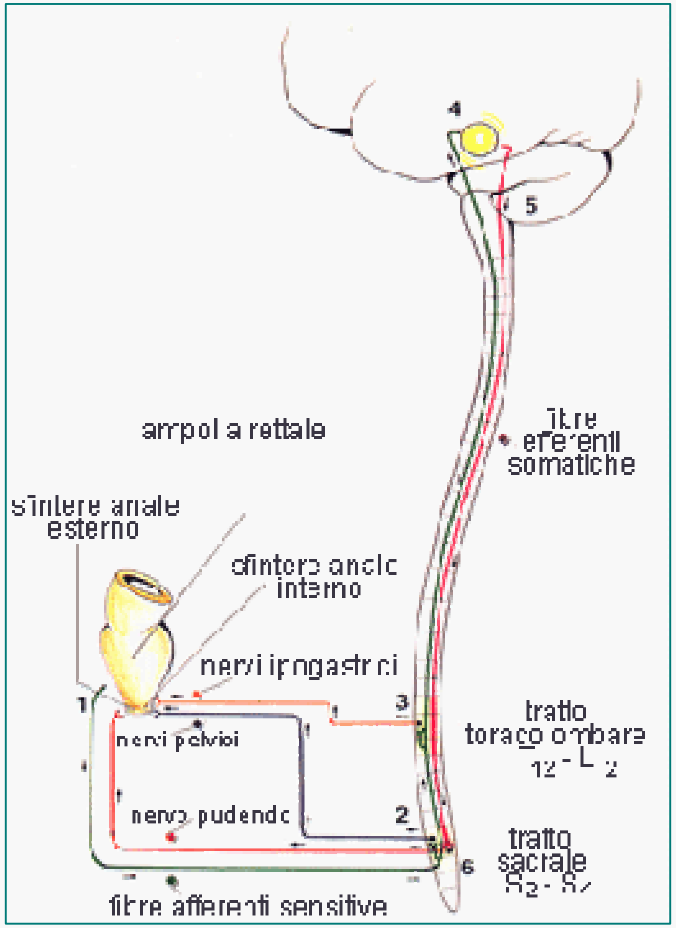
SNA pelvi
Funzione sessuale

Jackson KS et al. Pelvic floor dysfunction and radical hysterectomy. Int J Gynecol Cancer 2006

SIMPATICO: contrazione ritmica degli organi e dotti genitali durante l’orgasmo
PARASIMPATICO: aumento flusso sanguigno ai genitali, lubrificazione vaginale, edema delle labbra e clitoride

SNA pelvi
Funzione ano-rettale

2003.



SIMPATICO: stimola la contrazione dello sfintere anale interno (chiusura tonica)

PARASIMPATICO: inibisce la contrazione dello sfintere anale interno (rilasciamento)

N. PUDENDO: efferenze somatiche motorie (contrazione sfintere anale esterno striato e contrazione dei m. pubo-rettale)

RAIR: riflesso retto-anale inibitorio
Rilasciamento dello sfintere interno a causa della distensione del retto (mediato da nervi intrinseci)

SNA pelvi
Funzione ano-rettale

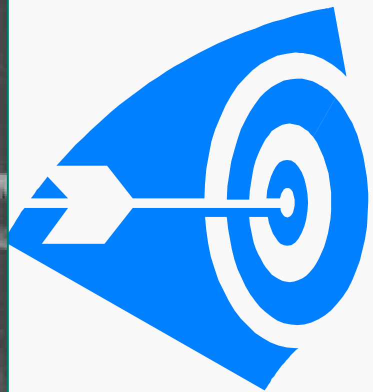
Sood A et al. Anorectal dysfunction after surgical treatment for cervical cancer. J Am Coll Surg 2002

Lesioni del plesso ipogastrico inferiore ➡ Evacuazione difficoltosa
Incontinenza fecale

Lesioni del n. pudendo ➡ Incontinenza fecale

Chirurgia demolitiva pelvica

Il presente: chirurgia *nerve-sparing*



Isterectomia radicale nerve-sparing

Cistectomia radicale nerve-sparing

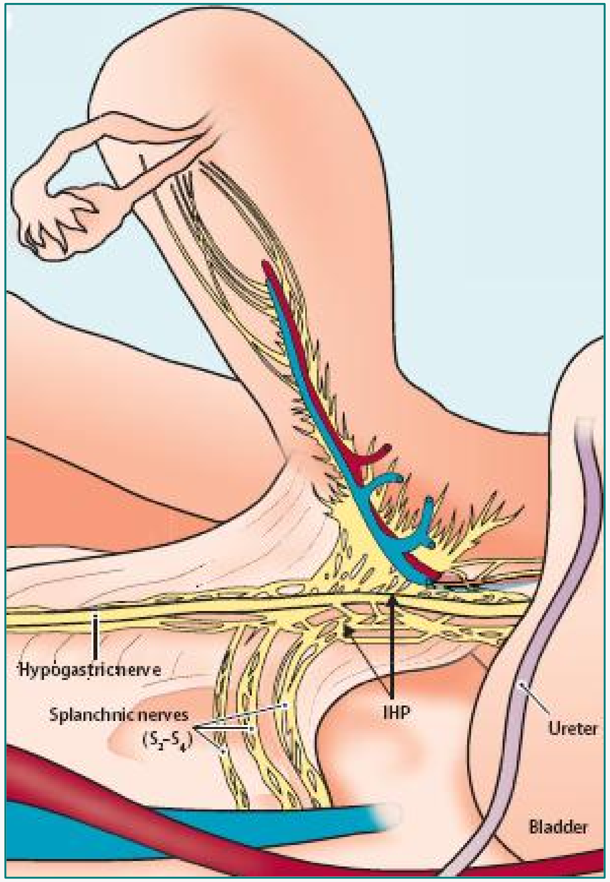
Prostatectomia radicale nerve-sparing

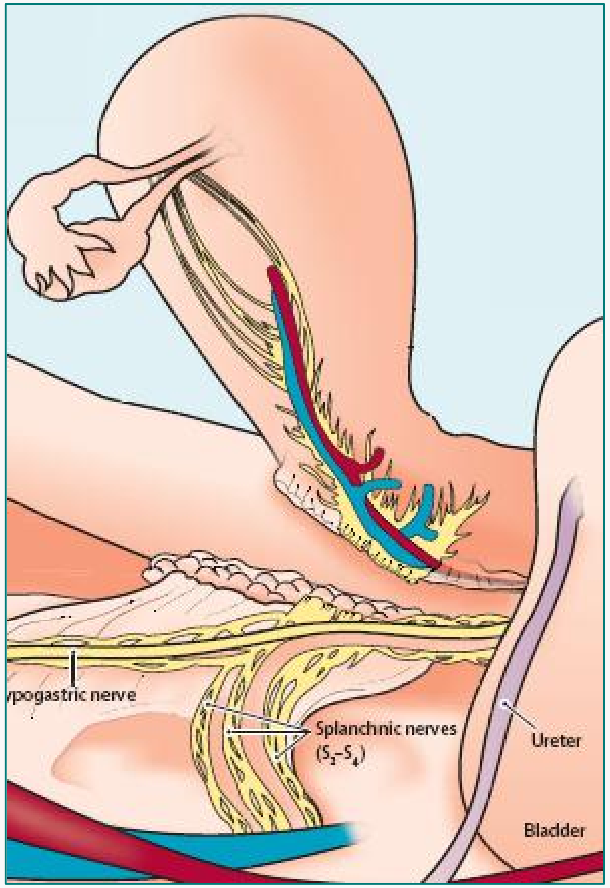
Resezione del retto nerve-sparing (Total Mesorectal Excision)

Isterectomia radicale
nerve-sparing

Querleu D et al. Classification of radical hysterectomy. Lancet Oncol 2008.

-Asportazione dei parametri
-Asportazione del terzo sup. della vagina
-Sezione dei legamenti utero-sacrali
-Resezione del legamento cardinale
-Linfoadenectomia presacrale





Isterectomia radicale n-s

Querleu D et al. Classification of radical hysterectomy. Lancet Oncol 2008. Piver MS et al. Five classes of extended hysterectomy for women with cervical cancer. Obstet Gynecol 1974

	Extent of resection	Ureter	Comment
A—minimum resection of paracervix	Paracervix is transected medial to ureter, but lateral to the cervix; uterosacral and vesicouterine ligaments are not transected at a distance from the uterus; vaginal resection—generally at a minimum, without removal of the paracolpos	Palpation or direct visualisation without freeing from bed	..
B—transection of paracervix at the ureter	Paracervix is transected at the level of the ureteral tunnel; partial resection of uterosacral and vesicouterine ligaments; no resection of caudal (deep) neural component of the paracervix (caudal to the deep uterine vein); vaginal resection—at least 10 mm of the vagina from the cervix or tumour	Unroofing and rolled laterally	The border between paracervical and iliac (parietal) lymph-nodes is the obturator nerve (the combination of paracervical and parietal lymph-node dissections is a comprehensive pelvic-node dissection, and can be equivalent to that of a type C1 resection)
B1	As described above		..
B2	As described above and with additional removal of the lateral lymph nodes		..
C—transection of paracervix at junction with internal iliac vascular system	Transection of the uterosacral ligaments at the rectum; transection of the vesicouterine ligaments at the bladder; resection 15–20 mm of the vagina from the tumour or cervix and corresponding paracolpos	Completely mobilised	..
C1	With autonomic nerve sparing/preservation		..
C2	Without autonomic nerve sparing/preservation		..
D—laterally extended resection			
D1	Resection of the paracervix at the pelvic side, with vessels arising from internal iliac system, exposing the roots of the sciatic nerve	Completely mobilised	..
D2	Resection of the paracervix at the pelvic side, with hypogastric vessels plus adjacent fascial or muscular structures (laterally extended endopelvic resection)		..

All types of radical hysterectomy are combined with lymph-node dissection: level 1—external and internal iliac level; level 2—level 1 plus common iliac and presacral; level 3—level 2 plus aortic infra-mesenteric; level 4—level 3 plus aortic infrarenal.

Table: Classification of radical hysterectomy

Isterectomia radicale n-s
Lesioni nervose

Rob L et al. Nerve-sparing and individually tailored surgery for cervical cancer. Lancet Oncol 2010

Panel: **Procedures and types of nerves which can be injured**

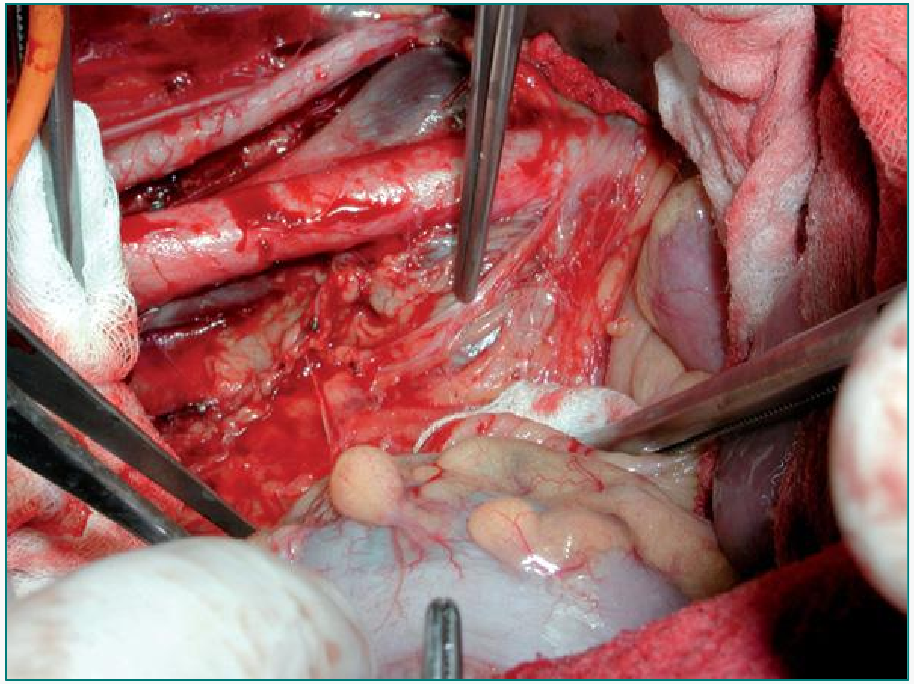
Presacral lymphadenectomy
Superior hypogastric plexus

Resection of dorsal paracervix (uterasacral ligaments and rectovaginal ligaments)
Hypogastric nerves bilaterally

Resection of dorsal paracervix or wasteful preparation of pararectal space
Proximal part of the inferior hypogastric plexus and splanchnic nerves

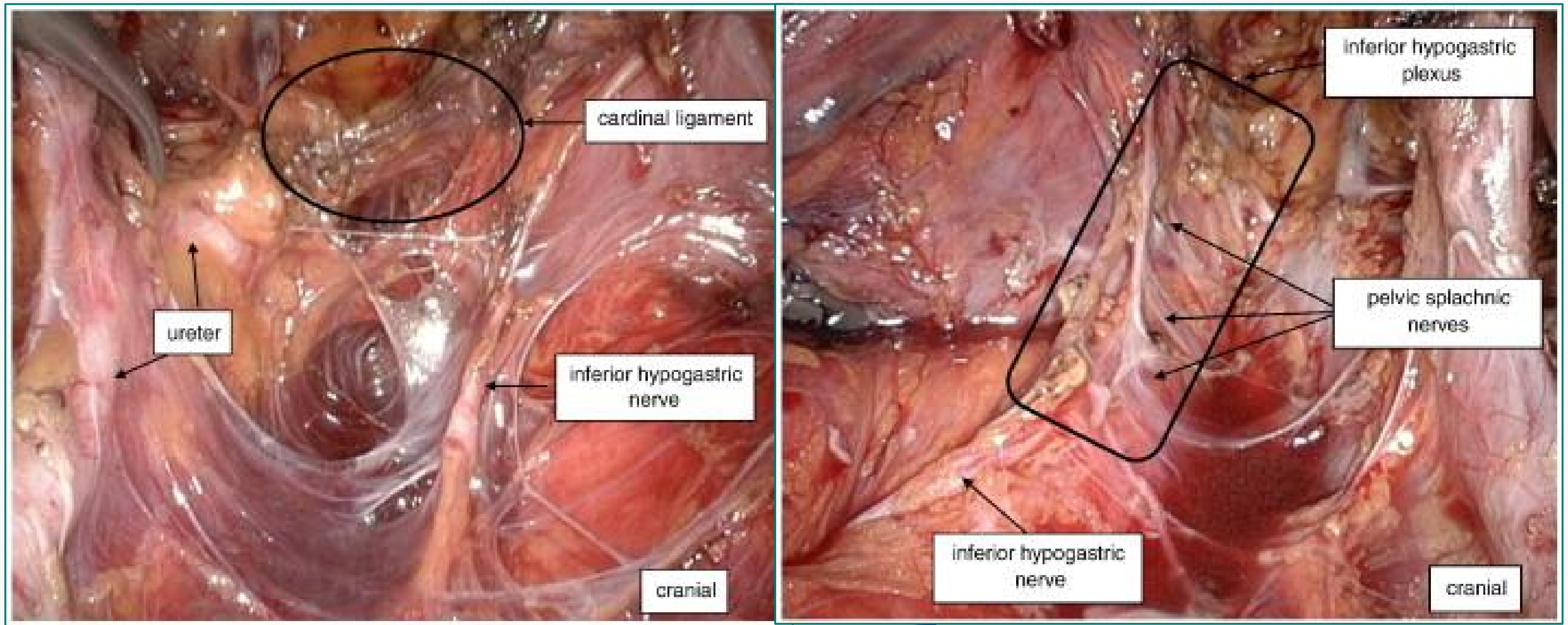
Resection of lateral part of the paracervix in space of deep uterine vein
Inferior hypogastric plexus and splanchnic nerves

Resection of deep vesicouterine ligaments
Distal part of the inferior hypogastric plexus



Isterectomia radicale n-s laparoscopica

Kavallaris A. Laparoscopic nerve-sparing radical hysterectomy: description of the technique and patient's outcome. Gynecol Oncology 2010; Park NY et al. Laparoscopic pelvic anatomy of nerve-sparing radical hysterectomy. Clin Anatomy 2010. Possover M et al. The LANN technique to reduce postoperative functional morbidity in laparoscopic radical pelvic surgery. J Am Coll Surg 2005.



Laparoscopic neuronavigation technique

Isterectomia radicale n-s
Risultati funzionali

Jackson KS et al. Pelvic floor dysfunction and radical hysterectomy. Int J Gynecol Cancer 2006; Benedetti- Panici P et al. Long-term bladder function in patients with locally advanced cervical carcinoma treated with neoadjuvant chemotherapy and type 3-4 radical hysterectomy. Cancer 2004; Raspagliesi F et al. Type II versus type III nerve-sparing radical hysterectomy: comparison of lower urinary tract dysfunction. Gynecol Oncol 2006. Pieterse Qd et al. An observational longitudinal study to evaluate miction, defecation, and sexual function after radical hysterectomy with pelvic lymphadenectomy for early-stage cervical cancer, Int J Gynecol cancer 2006.

Disfunzioni vescicali: 5-76%

-Alterata sensibilità vescicale
-disfunzioni di riempimento e svuotamento vescicale
-Incontinenza urinaria

Disfunzioni sessuali:5-85%

-Dispareunia
-ridotta lubrificazione vaginale
-Insoddisfazione

Correlate con il grado di radicalità chirurgica (tipo di isterectomia radicale)

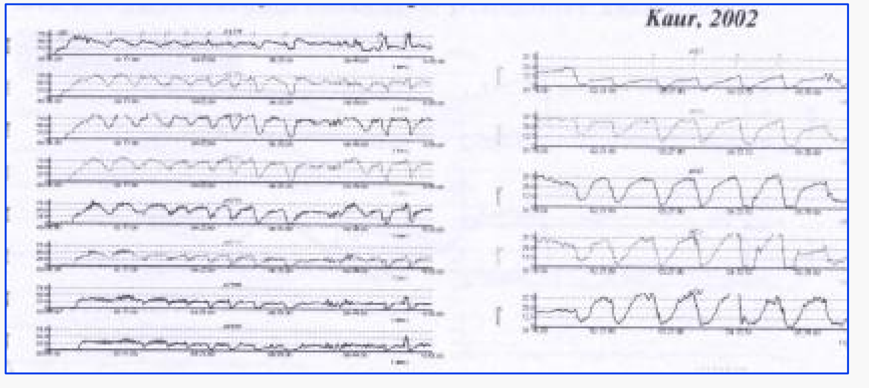
Isterectomia radicale n-s
Risultati funzionali

Jackson KS et al. Pelvic floor dysfunction and radical hysterectomy. Int J Gynecol Cancer 2006; An observational longitudinal study to evaluate miction, defecation, and sexual function after radical hysterectomy with pelvic lymphadenectomy for early-stage cervical cancer, Int J Gynecol cancer 2006.

Disfunzioni anorettali:20-55%

-Stipsi
-difficoltosa evacuazione
-assenza dello stimolo rettale
-tenesmo
-diarrea
-incontinenza fecale

Alterazioni manometriche:
-alterata sensibilità rettale
-riduzione delle pressioni sfinteriali
-alterazione del RRAI



Zullo MA et al. Vesical dysfunctions after radical hysterectomy for cervical cancer: a critical review. Crit Rew in Oncol Hematol 2003

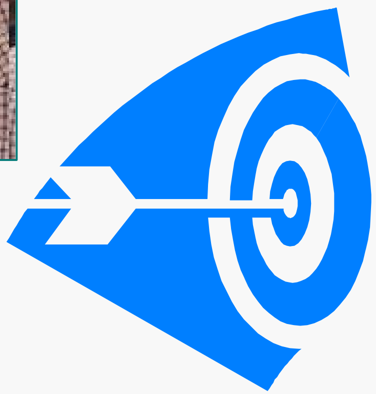
Table 1
Long-term studies of urethro-vesical function after radical hysterectomy

Author (yr)	No. of patients	Type of radical hysterectomy	Methodology of study			Urinary findings and results
			Type study	Methods	Follow-up time	
Green (1952) [26]	623	–	R	IVP; Cyst.	20 yr	Fistulae, atonic bladder, pyelonephritis
Glahn (1970) [9]	27	–	R	Cystom.	12 mo	Sensory loss, atonic bladder, residual urine, incontinence
Forney (1980) [5]	22	Piver 2	P	IVP; Cyst.; Urodyn.	6–43 mo	Hypertonic bladder followed by sensory loss, stress incontinence
Low (1981) [3]	20	Piver 3	P	Urodyn.	12 mo	Decrease of urethral pressure; transient urinary retention (25%)
Manzl (1981) [27]	111	Piver 3	P	Urodyn.	2–36 mo	Sensory loss within the first year after operation (89%); sensory loss after the first year surgery (45%)
Sasaki (1982) [16]	30	–	P	Urodyn.	12 mo	Decrease of urethral pressure; stress incontinence (3%)
Carenza (1982) [28]	15	Piver 3	P	Urodyn. Denerv. test	7–12 mo	Motor and sensory loss (80%); decreased bladder capacity (30%); positive denerv. sensitiv. test (40%)
Asmussen (1982) [29]	18	Piver 2	P	IVP; Cyst.; VPS	12 mo	No significant changes in parameters of urethrovesical function (all patients had nerve-sparing operation)
Kadar (1983) [30]	58	Piver 3	R	Teleph. interv.	10 yr	12% severe stress incontinence; 36% mild incontinence from absent bladder sensation or urinary loss
Kristensen (1984) [31]	27	–	P	Urodyn.	17–32 mo	Severe stress incontinence (7%); positive denervation sensitivity test (41%)
Scotti (1986) [2]	12	Piver 2 and 3	P	IVP; Urodyn.	12 mo	Genuine stress incontinence (50%); atonic bladder (36%); motor and sensory loss (25% and 17%); impaired flow (17%); increased residual urine (25%)
Fishman (1986) [32]	22	–	P	Teleph. interv. Urodyn.	5–41 mo	Genuine stress incontinence (70%); sensory loss (55%); impaired flow (75%); increased residual urine (10%)
Bandy (1987) [33]	61	Piver 3	P	Cystom.	7–236 mo	Atonic bladder (25%); low compliance (31%); detrusor instability (4%); increased residual urine (16%)
Ralph (1988) [34]	40	Piver 3	P	IVP; Urodyn.	12 mo	Abdominal straining to void (85%); residual urine (0%); sensory loss (63%); high compliance (40%); low compliance (22%); stress incontinence (55%)
Loran (1992) [35]	154	–	P	Urodyn.	12 mo	Urethral instability only in the group with 2/3 vaginal resection (18%)
Sekido (1997) [36]	9	–	R	IVP; Urodyn.	14–36 yr	Impaired flow and increased residual urine (100%); Sensory and motor loss (100%); low compliance (71%)
Naik (2001) [37]	77	–	R	Quest. Urodyn. (24 pts)	12 mo	Regular incontinence (31%); genuine stress incontinence (71%); impaired bladder compliance (25%)

R, retrospective; P, prospective; IVP, intravenous pyelogram; Cyst., cystoscopy; Cystom., cystometry; Urodyn., urodynamics (flowmetry, cystometry, urethral profile); VPS, voiding pressure study; Quest., questionnaire.

Chirurgia demolitiva pelvica

Il presente: chirurgia *nerve-sparing*

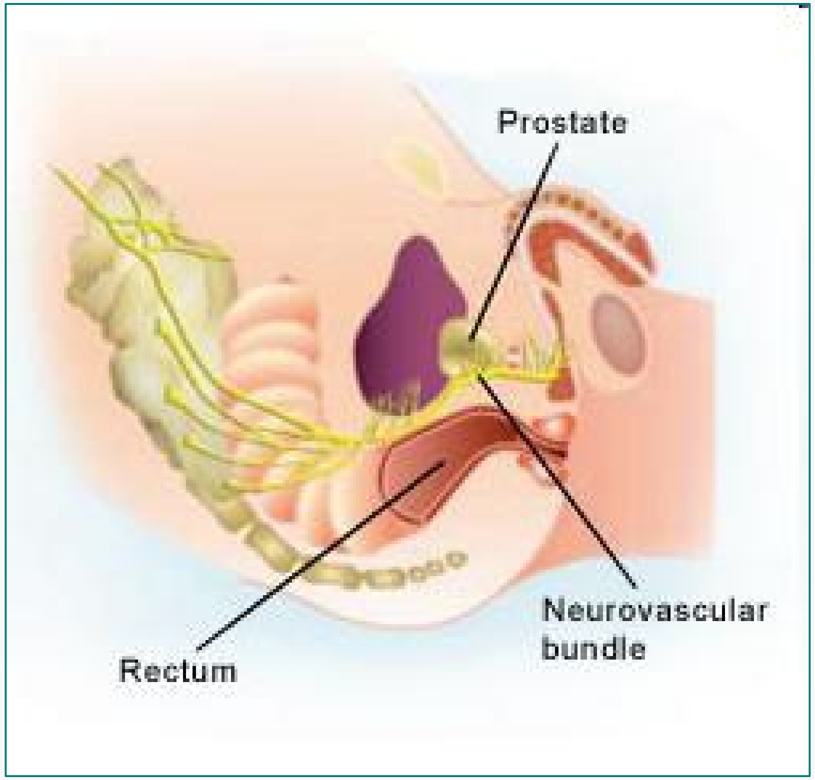


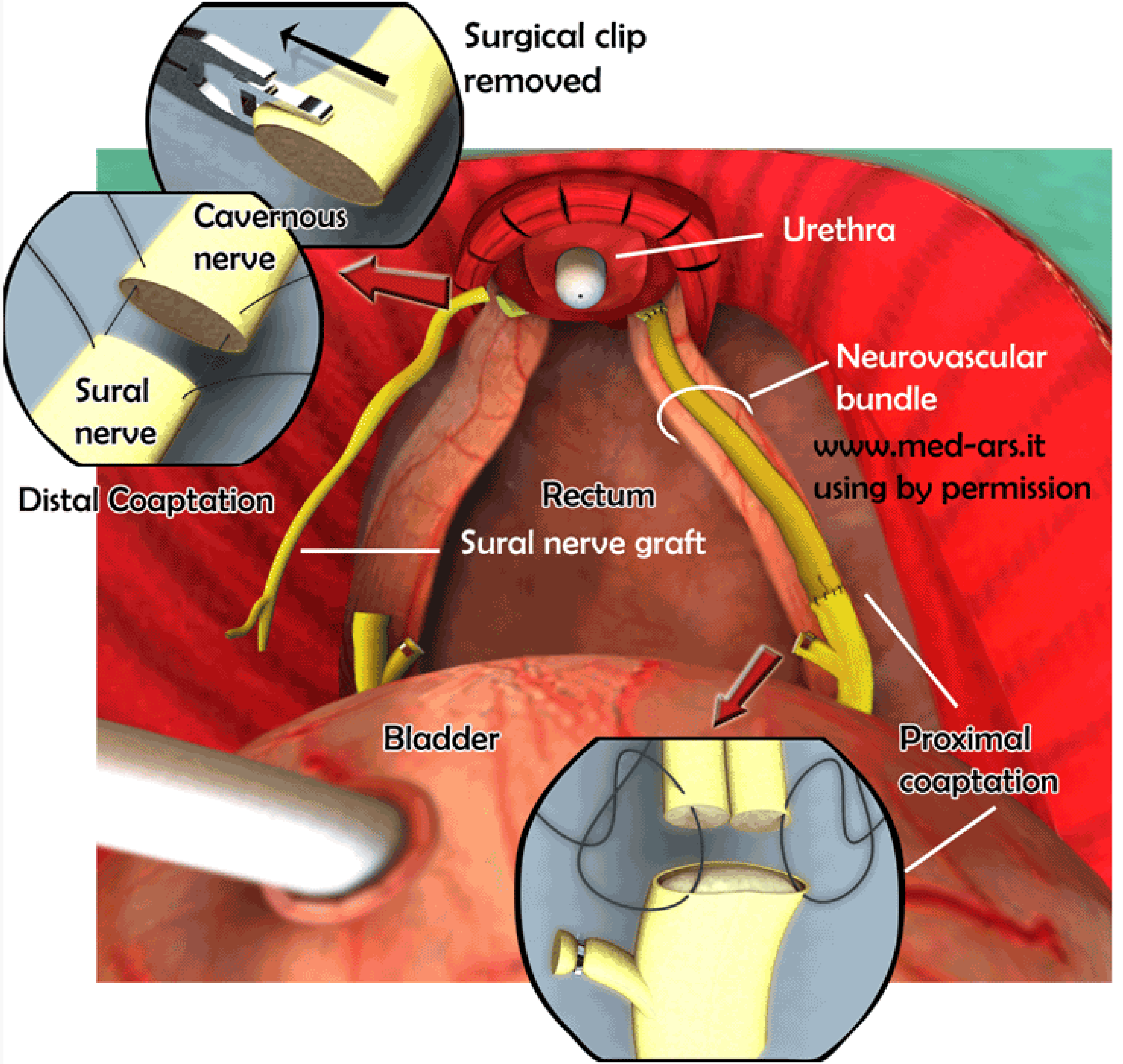
- Isterectomia radicale nerve-sparing
- Cisto-prostatectomia radicale nerve-sparing
- Resezione del retto nerve-sparing (Total Mesorectal Excision)

Cisto-prostatectomia radicale
Nerve-sparing

Hautmann RE et al. Nerve-sparing radical cystectomy: a new technique. European Urology Suppl 2010. Hautmann RE. The oncologic results of laparoscopic radical cystectomy are not (yet) equivalent to open cystectomy. Curr Opin Urol. 2009

-**Cisto-prostatectomia radicale** en bloc
-Linfadenectomia iliaco-otturatoria pelvica bilaterale (preservazione fibre simpatiche)
-Prostatectomia intrafasciale (retrograda)
-Conservazione delle vescichette seminali, dotti deferenti e fasci neuro-vascolari
-Preservazione del plesso pelvico e dei nervi erigentes
-Preservazione del plesso neurovascolare e della parete vaginale anteriore vicina al collo vescicale nelle donne
-Neovescica ileale (reservoir ortotopico)

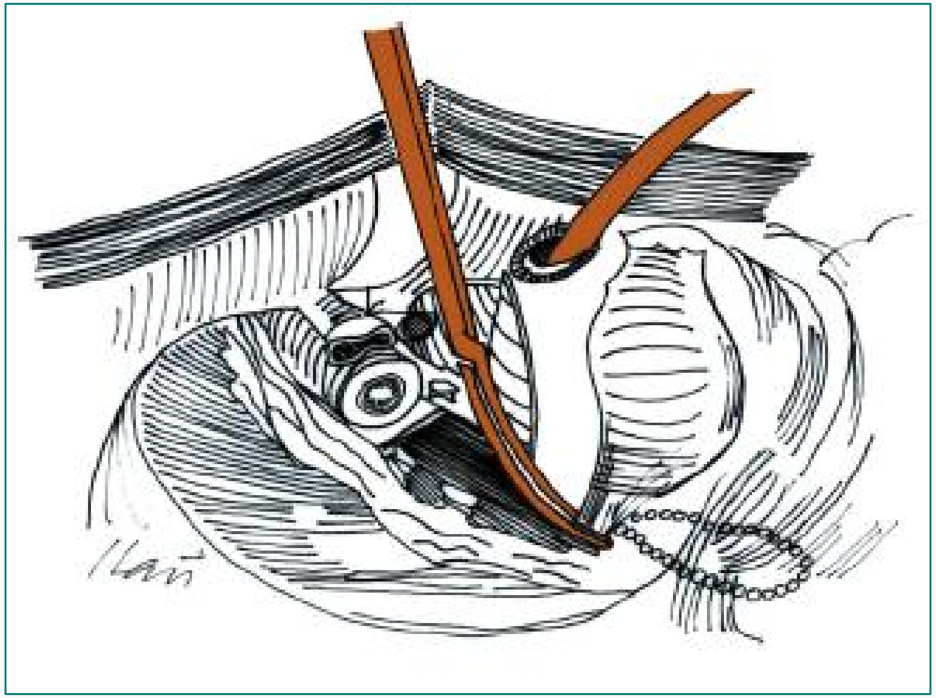



Surgical clip removed
Cavernous nerve
Sural nerve
Distal Coaptation
Urethra
Neurovascular bundle
www.med-ars.it
using by permission
Rectum
Sural nerve graft
Bladder
Proximal coaptation

Cisto-prostatectomia radicale potency-sparing

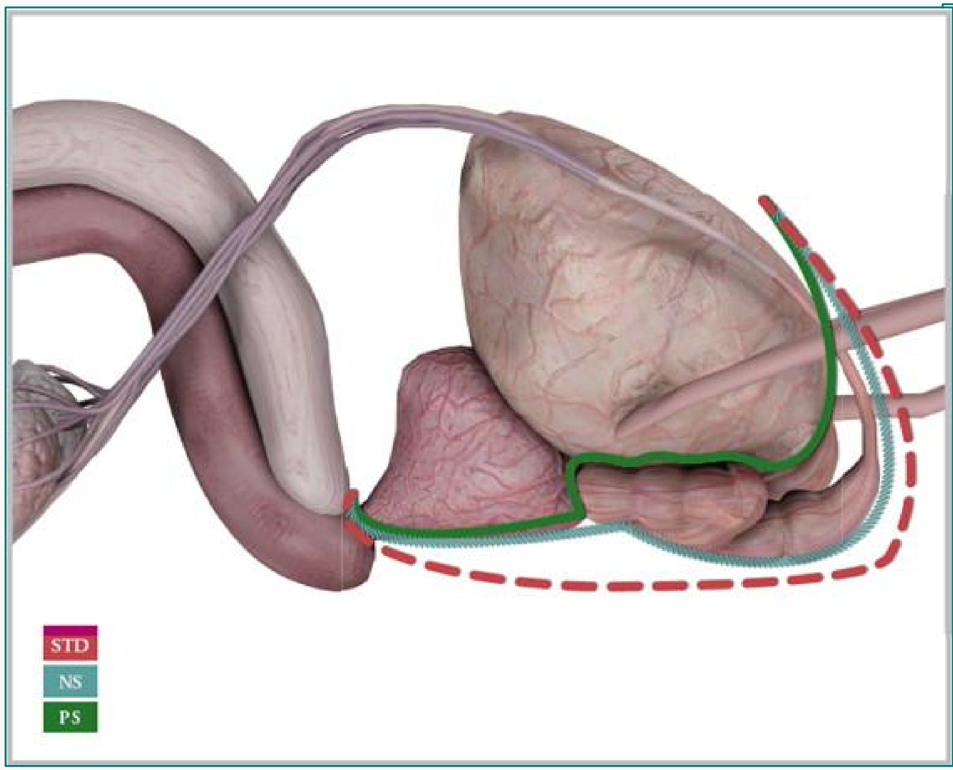
Hautmann RE et al. Nerve-sparing radical cystectomy: a new technique. European Urology Suppl 2010.

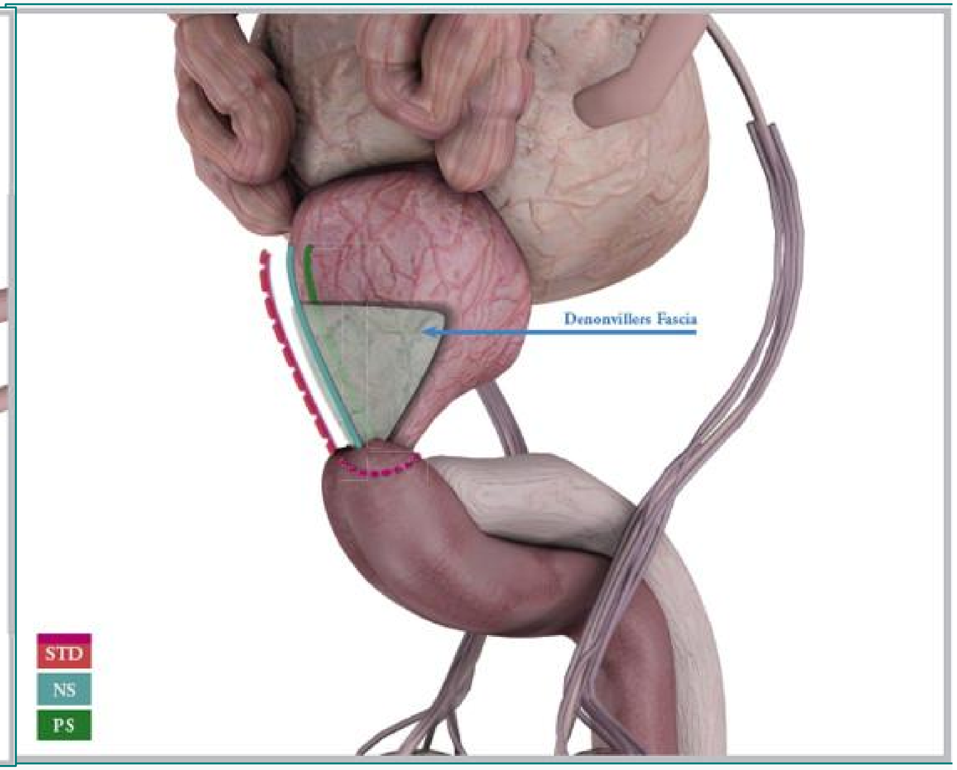
-Conservazione delle vescichette seminali e dotti deferenti con asportazione intrafasciale della prostata



Cistectomia radicale
Potency sparing

Puppo P et al. Potency preserving cystectomy with intrafascial prostatectomy for high risk superficial bladder cancer. The J of Urology 2008





Cistectomia radicale
Prostate-sparing

Hautmann RE, Stein JP. Neobladder with prostatic capsule and seminal-sparing cystectomy for bladder cancer: a step in the wrong direction. Urol Clin North Am. 2005

Stein JP. Prostate-sparing cystectomy: a review of the oncologic and functional outcomes. Contraindicated in patients with bladder cancer. Urol Oncol. 2009

Prostate-sparing cystectomy

-Conservazione della prostata, dotti deferenti, vescichette seminali, eventuale asportazione di adenoma prostatico

-Tecnica riservata a giovani pazienti senza carcinoma prostatico o in assenza di coinvolgimento prostatico dalla neoplasia vescicale

-funzione eretttile: 75-100%

-alto tasso di recidiva (21%) e rischio di ca prostatico (6%)

-alto tasso di metastatizzazione a distanza (>5% rispetto alla cistoprostatectomia)

-ritenzione urinaria cronica (residuo prostata)

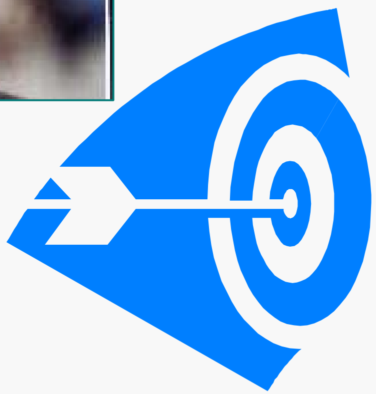
Cisto-prostatectomia n-s
Risultati funzionali

Kessler TM et al. Attempted nerve sparing surgery and age have a significant effect on urinary continence and erectile function after radical cystoprostatectomy and ileal orthotopic bladder substitution. J Urol 2004, Walsh PC et al. Radical Prostatectomy and Cystoprostatectomy with Preservation of Potency. Results Using a New Nerve-sparing Technique. BJUI 2008

Autore	Tipo intervento	Continenza diurna Continenza notturna	Funzione erettile conservata
Ong J Urol 2010	Seminal vescicle sparing c-p Orthotopic bladder	93% 43%	79%
Souliè Adult Urol 2001	Seminal vescicle sparing c-p Orthotopic bladder	80% 61%	?
Puppo J Urol 2008	Seminal vescical-sparing c-p Intrafascial prostectomy Orthotopic bladder	97,2 % 95%	95%
Botto BJUI 2004	Prostate sparing Orthotopic bladder	90% 85%	69%

Chirurgia demolitiva pelvica

Il presente: chirurgia *nerve-sparing*



Isterectomia radicale nerve-sparing
Cistectomia radicale nerve-sparing
Prostatectomia radicale nerve-sparing
Resezione del retto nerve-sparing
(Total Mesorectal Excision)

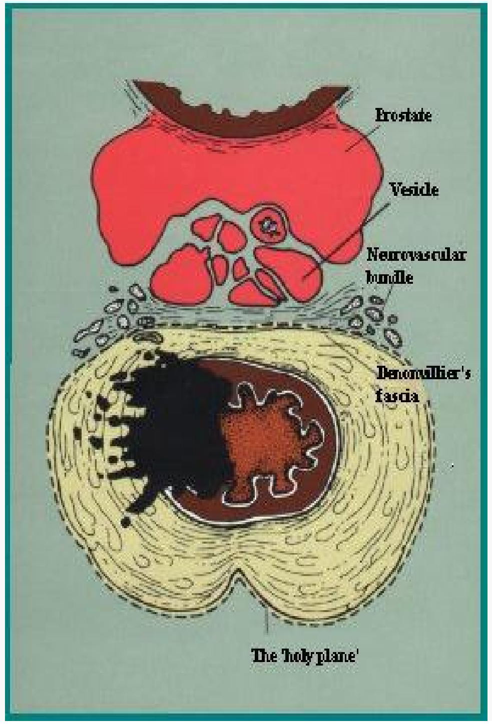
Resezione del retto
TME: total mesorectal excision

Heald RJ, et al. The mesorectum in rectal cancer surgery - the clue to pelvic recurrence? Br J Surg 1982.

•Superiorità oncologica: riduzione della recidiva locale (dal 30% fino al 4% se associata alla CT-RT neoadiuvante)
•Presupposti anatomici: fascia endopelvica e nervi pelvici autonomici, legamenti laterali e retto-sacrali
•Nerve-preserving Conservazione della funzione urinaria e sessuale
•Anastomosi coloanale (diretta o colonic pouch) o colostomia (AAP
•secondo Miles)

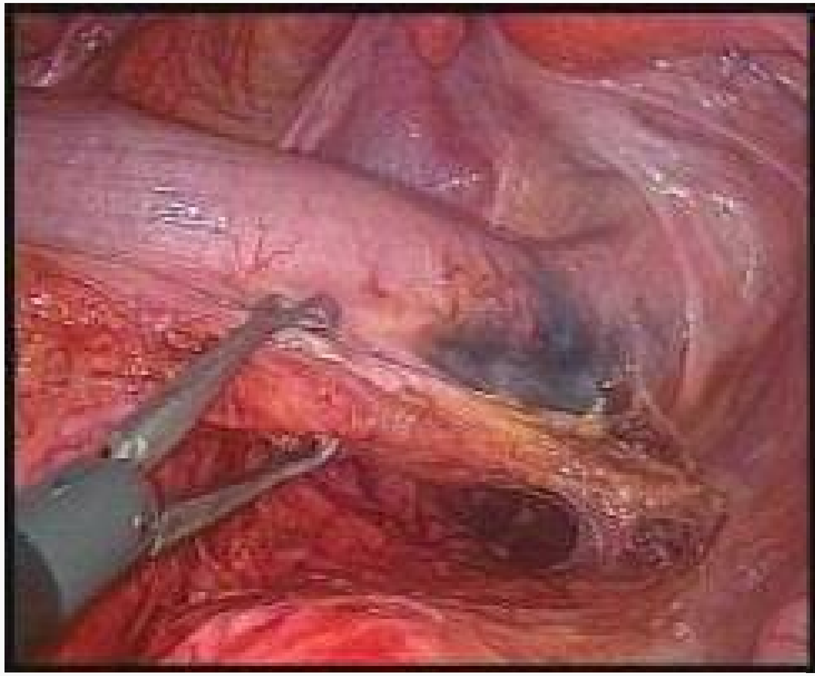
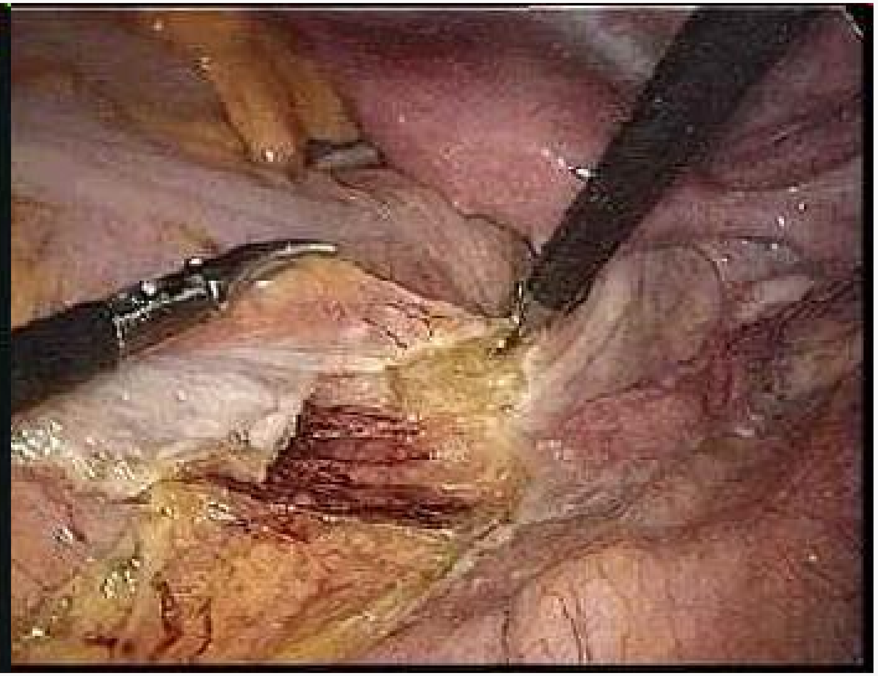
• Mesoretto
foglietto viscerale
foglietto parietale
(perietal e/oWaldayer’s fascia)

• Denonviller’s fascia



TME
Video-assistita

Liang J-T. Laparoscopic pelvic autonomic nerve-preserving surgery for patients with lower rectal cancer after chemoradiation therapy. Ann Surg Oncol 2006; Patriti A et al. Short and medium term outcome of robot-assisted and traditional laparoscopic rectal resection. JSLS 2009.

TME
Risultati funzionali

Moriya Y. Function preservation in rectal cancer surgery. Int J Clin Oncol 2006. Sartori CA et al. Urinary and sexual disorders after laparoscopic TME for rectal cancer in males. J Gastrointest Surg 2011

Disfunzioni vescicali: 2,7-31%

-Alterata sensibilità vescicale
-Disfunzioni di riempimento e svuotamento vescicale
-Incontinenza urinaria

Disfunzioni sessuali:5,5-26%

-Disfunzione erettile
-Disfunzioni dell'eiaculazione

-Dispareunia
-Ridotta lubrificazione vaginale
-Insoddisfazione

TME
Risultati funzionali

Moriya Y. Function preservation in rectal cancer surgery. Int J Clin Oncol 2006, Shibata D, Cohen A, Dis Colon Rectum 2000

Disfunzioni anorettali: 2,7-13,7%

Sphincter-saving surgery
Functional results

- Impaired rectal reservoir function
- Impaired anal sphincters pressures
- Anal sphincter defects at endoanal ultrasound
- Diarrhea or frequent defecation
- Operative damage to pelvic nerves

- Average number of bowel movements per day (4,2)
- Incontinence of gas (frequency) (39%)
- Incontinence of stool (17%)
- Soiling while awake (67%)
- Soiling while asleep (50%)
- Urgency (56%)
- Episodes of multiple or frequent evacuation (67%)
- Need to wear a pad (56%)
- Use of antidiarrheal medications (56%)

Early postoperative period: faecal incontinence

TME e Radioterapia

Risultati funzionali

Dehni N. Clinical effects of preoperative radiation therapy on anorectal function after proctectomy and colonic j-pouch-anal anastomosis. Dis Colon Rectum 2002

- Radiation damage to the neorectum (postoperative RT)
- Reduction in rectal capacity and compliance
- Degeneration of the nervous plexi within the bowel wall
- Damage to the anal sphincter (diminished mean resting p.)

Minimal adverse effects of preoperative radiation on neorectal function

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Il ruolo del chirurgo

G A Porter. Surgeon-related factors and outcome in rectal cancer. Ann Surg. 1998.
Luna-Pérez P. The surgeon as prognostic factor for local recurrence and survival in the anal sphincter preservation for mid-rectal cancer Rev Invest Clin. 1999.

Controllo locale della malattia

Preservazione della funzione

Il ruolo della riabilitazione

GOAL: improve the ability of the patient to voluntarily contract the external anal sphincter and puborectalis muscles in response to rectal filling.

Strenght training: improve the strenght of these pelvic floor muscles (Anal canal pressure or intra-anal EMG)

Sensory training:increase the patient’s ability to perceive distensions of the rectum (Ballon feedback device)

Coordination: coordinating muscles contraction in response to intrarectal distension

Conclusioni

Occorre molta esperienza per identificare le fibre nervose, ma conoscere la loro esistenza, localizzazione e funzione è il fattore più importante per preservarle. (S.A.)