Innovazione In Sala Operatoria : La Chirurgia Robotica in Chirurgia Generale

Maurizio Brausi
Presidente Collegio Italiano Chirurghi (CIC)
Direttore Scientifico CUrE
Hesperia Hospital
Modena

Collegio Italiano dei Chirurghi

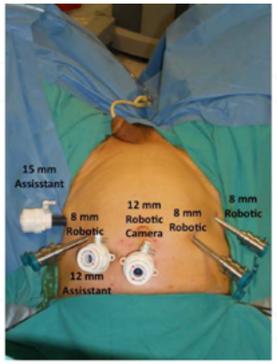
Collegio Italiano dei Chirurghi

Comprende 59 Società Chirurgiche Italiane che fanno capo a circa 50.000 chirurghi

Storia della Chirurgia Robotica

- Il termine Robot e Robotica e' stato introdotto negli anni 20 da Capek (Cecoslovacco)
- La Robotica in chirurgia è nata in USA nel 1985 come PUMA 560 usata per biopsie cerebrali di alta precisione
- All'inizio degli anni 90 l'esercito americano stabilì una collaborazione con l'Istituto di ricerca di STANDFORD: obiettivo…TELECHIRURGIA per operare da lontano ed in tempi veloci i feriti sul campo di battaglia e diminuire la mortalità. Ospedali chirurgici mobili collegati a distanza con un operatore

Current


15 mm
Assisstant
8 mm
Robotic
12 mm
Robotic
Camera
8 mm
Robotic
8 mm
Robotic
12 mm
Assisstant

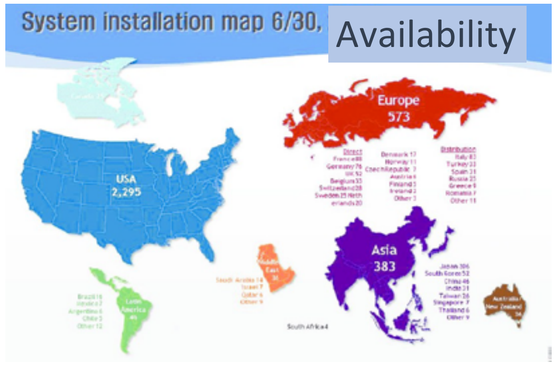
Why Robotic RP …. Benefits?

- Smaller incisi

- Less pain
- Better Vision

- Intuitive..easy moveme
- Less blood loss

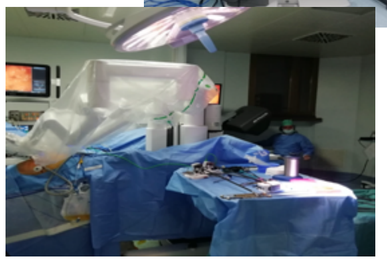
- ***Faster Recovery***
- ***Short Learning curve for young***



Number of da Vinci system installation in the world until 2015.
http://www.intuitivesurgical.com/products/davinci_surgicalsystem/da-vinci-si-surgical-system.aspx

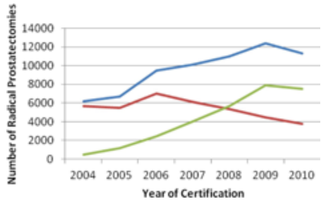
Numero interventi dal 2021 al dicembre 2022 in Italia

- Sono stati eseguiti più di 35.000 interventi con un aumento del 16% rispetto al 2021
- Specialità
  1 . Urologia (67%)
- 2. Chirurgia Generale (16%)
- 3. Ginecologia (10%)
- 4. Chir. Toracica
- 5. Otorino

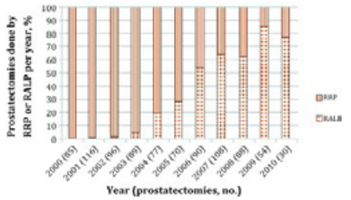


2022 : 37.000 new cases of PCA

Number of RARPs in the US



Red: open
Green: robotic
Blue: total

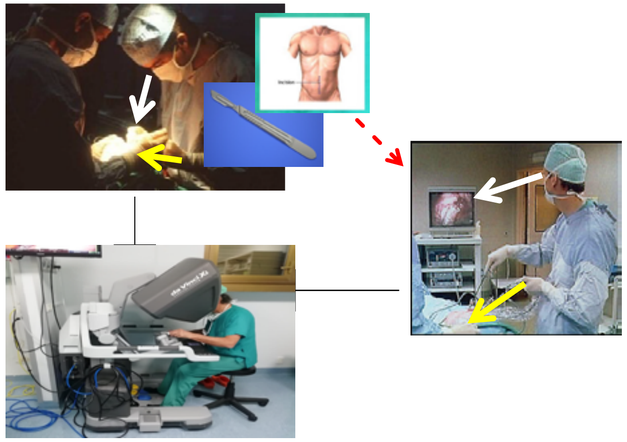


Alemozaffar et al, Eur Urol 2015 67-432-438
Lowrance et al, J Urol 2012 187:2087-2093

Domande

- Costo-beneficio
- Sostenibilità
- Futuro…. teaching

Surgical Process

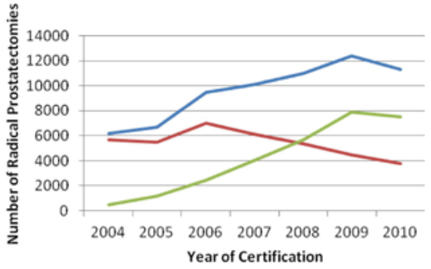


Innovazione in Sala Operatoria: La Chirurgia Robotica

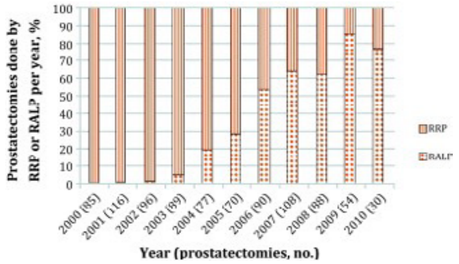
Maurizio Brausi
Presidente CIC
Scientific Director C.Ur.E
Dept of Urology
Hesperia Hospital Institute Modena
e-mail: mauriziobrausi@gmail.com

2022 : 37.000 new cases of PCA

Number of RARPs in the US

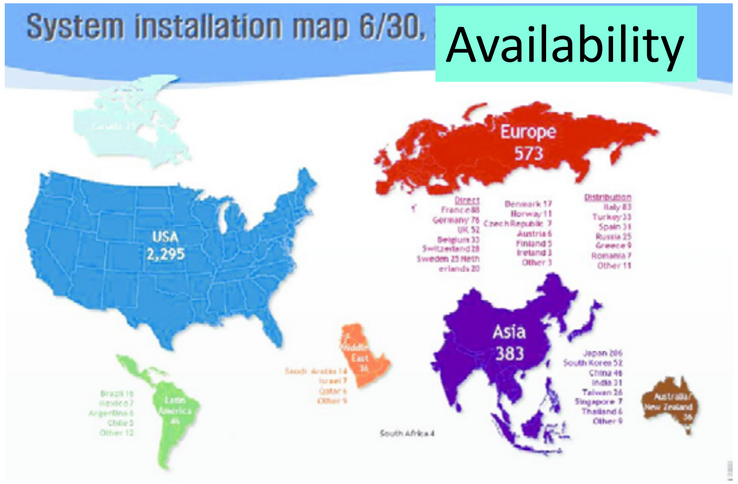


Red: open
Green: robotic
Blue: total



Advent of Robotic surgical technology

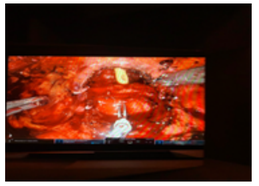
- Initially developed by the US Department of Defense for use in military battlefield applications, robotic technology was adapted for civilian use through the efforts of 2 rival corporations, **Intuitive Surgical**, and **Computer Motion**
- These companies simultaneously developed robotic interfaces for use in human surgical applications.
- Computer Motion, Inc, introduced the Zeus Surgical System at approximately the same time that Intuitive Surgical, Inc, developed its **da Vinci Surgical System.**


System installation map 6/30,
Availability
Europe
573
USA
2,295
Asia
383
Latin America
46
Middle East
36
Australia/ New Zealand
30
South Africa 4

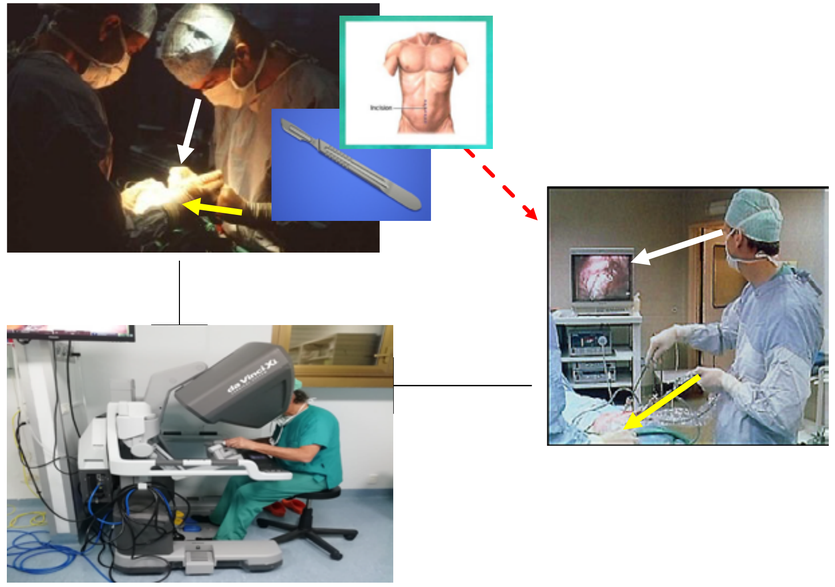
Why Robotic RP …. Benefits?

- Smaller incision
- Less pain
- Better Vision
- Intuitive..easy movements
- Less blood loss
- *Faster Recovery*
- *Short Learning curve for young*

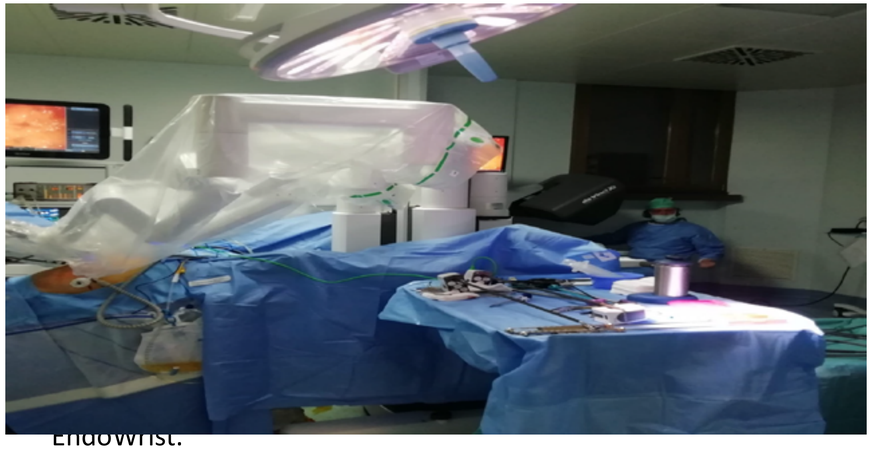





Surgical Process



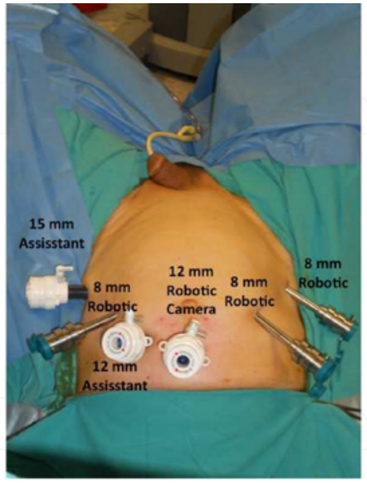
The Da Vinci System



EndoWrist.

- The first reported robot-assisted laparoscopic prostatectomy using the da Vinci system was described by Abbou et al in 2001.[4]
-

Current


15 mm
Assisstant
8 mm
Robotic
12 mm
Assisstant
12 mm
Robotic
Camera
8 mm
Robotic
8 mm
Robotic

Advent of Robotic surgical technology

- Initially developed by the US Department of Defense for use in military battlefield applications, robotic technology was adapted for civilian use through the efforts of 2 rival corporations, **Intuitive Surgical**, and **Computer Motion**
- These companies simultaneously developed robotic interfaces for use in human surgical applications.
- Computer Motion, Inc, introduced the Zeus Surgical System at approximately the same time that Intuitive Surgical, Inc, developed its **da Vinci Surgical System.**

Rise of robotic radical prostatectomy

- Menon et al from the Vattikuti Urology Institute at Henry Ford Hospital in Detroit, Michigan, are responsible for the development and popularization of robotic radical prostatectomy[]
- Presently the transperitoneal approach is the most widely adopted because of the quick and easy access to the peritoneal cavity
- This technique has been gaining widespread acceptance in the US and Europe and is increasing in penetration worldwide.

Outline

- Surgical Quality
- Morbidity and Mortality
- Oncologic Outcomes

SURGICAL QUALITY

Technique for Robotic RP

- The basic technique for performing minimally invasive RP is the same regardless of the technology used.
- Personal attitude: with robot I try to reproduce the same technique I use in Open RP: our center of Modena-Carpi performed > 3500 cases of ORP
- **Main steps :**
  1. e-LND (intermediate-high-risk pts)
  2. Bladder neck preservation when possible
  3. Nerve sparing if indicated (accurate)
  4. Urethral Lenght Preservation (veru montanum seen)
  5. Water tight urethro-vesical anastomosis (Van Velthoven T.)

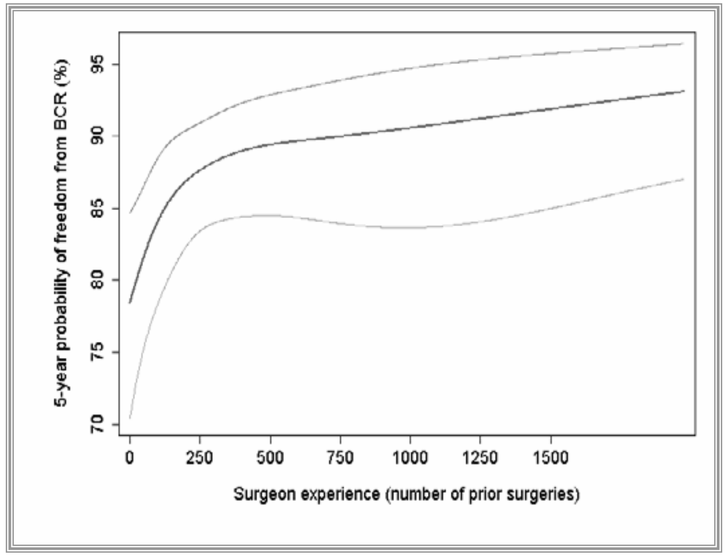
VARIABILITY AMONG SURGEON'S ON CANCER CONTROL AFTER RADICAL PROSTATECTOMY

Bianco FJ.[1AD], Vickers A.[12A], Serio A.[12A], Eastham JA.[1A], Kline EA.[1A], Reuther A.[1B], Kattan MW.[3B], Pontes JE.[1C], **Scardino PT.**[1A]

Departments of Urology[1], Biostatistics[2] and Quantitative Health Sciences[3]
Memorial Sloan-Kettering Cancer Center.[A]
Cleveland Clinic Foundation.[B]
Wayne State University.[C]
George Washington University.[D]

5-YR BCR-FREE PROBABILITIES BY SURGEON EXPERIENCE

Vickers & Bianco et al. JNCI (2008)

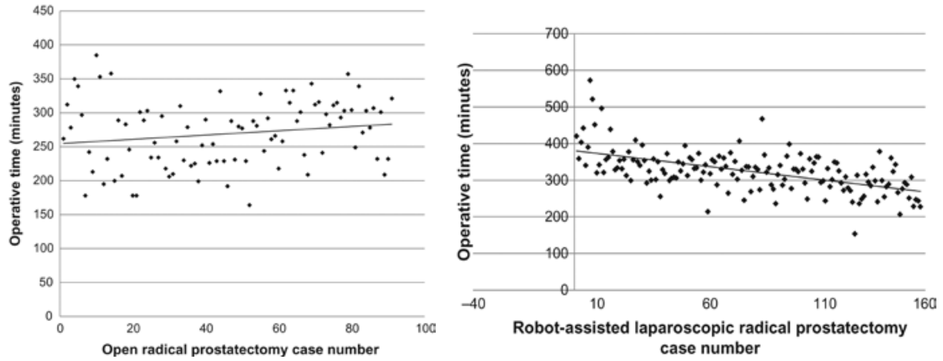


VARIATION AMONG SURGEONS

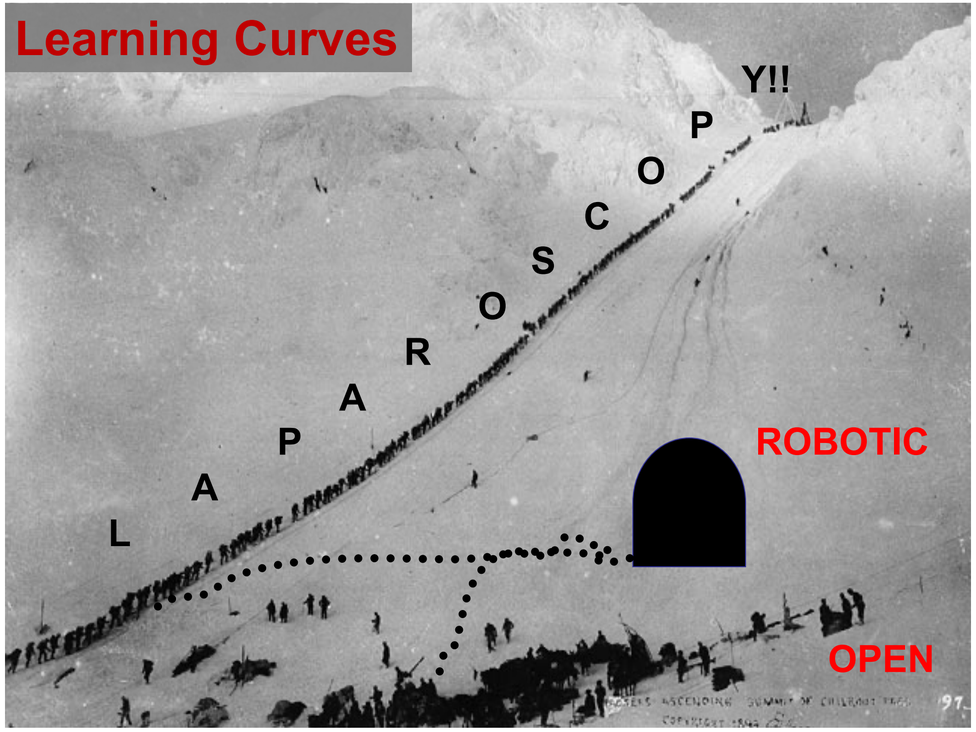
- Significant heterogeneity in BCR rates was observed between surgeons ($p<0.01$)

- $I^2 = 0.38$, implies that 38% of the observed difference in BCR rates between surgeons can be explained by genuine differences in surgical technique and approach, rather than by chance alone

Learning Curve?



- In order to be able to perform a good robotic RP 50-70 cases needed vs 500 for open RP (Brausi Eur Urol 2017)


Learning Curves
L
A
P
A
R
O
S
C
O
P
Y!!
ROBOTIC
OPEN

ONCOLOGIC OUTCOMES

Positive Surgical Margins

Study	Type	N	RRP	RARP	P Value
Yaxley et al '16	Randomized by surgeon A vs B	326	10%	15%	0.21
Desai et al '18	VA Database	244	41%	32%	0.18
Ong et al '15	Registry Victoria Australia	2002	34%	23%	<0.001
Alemozaffar et al '14	Health Professionals Follow Up Study	903	23%	24%	0.51
Haglind et al '15	Prospective non-randomized cohort (LAPPRO)	2431	21%	22%	NS
Guazzoni et al '06	Randomized, one surgeon	120	22%	26%	0.28

Oncological Outcomes after RARP

- *Oncological Outcomes after RARP: long term F-up in 4803 patients .*
  Results: RARP confers effective long-term Biochemical Control
  (Sukumar S et al BJUI 2014)
- *Long term control outcomes of RARP for PCA treatment a Metanalysis*
  20 Studies from 2010 to 1016 included.
  Results: No significant difference in 5-10 CR-free and CSS when compared to ORP (Wang L et al Int Urol Nephrol 2017)
- *Oncological Outcomes after RARP: a large european Single-Center Cohort with median 10 Yr F-up*
  885 patients **. Results:** RARP is effective after 10 years
  (Rayan P et al Eur Urol Focus 2018)

Oncological Outcomes After RARP

- RARP has similar oncological outcomes to open RP but improved potency outcomes….
  (Bath KRS et al J Endourol 2021)
- *The RECUORSE Study: long term o associated oncological outcomes associated with RARP : cervical, colorectal, lung and PCA: a systematic review and metanalysis*
  157,876 Robotic cases 68,007 Laparoscopic/thoracoscopic cases and 234,649 Open cases
  Results: For PCA long term outcomes similar for Robotic vs VDL vs Open surgery
  (Leitao MM et al Ann Surg 2023)

MORBIDITY AND MORTALITY

Estimated Blood Loss

Study	Type	N	RRP	RARP	P Value
Yaxley et al '16	Randomized by surgeon A vs B	326	1338	443	<0.001
Desai et al '18	VA Database	244	1075	200	<0.001
Alemozaffar et al '14	Health Professionals Follow Up Study	903	852	207	<0.001
Haglind et al '15	Prospective non-randomized cohort (LAPPRO)	2431	550	100	<0.001
Guazzoni et al '06	Randomized, one surgeon	120	853	257	<0.001

Transfusion Requirement

Study	Type	N	RRP	RARP	P Value
Yaxley et al '16	Randomized by surgeon A vs B	326	4%	1%	0.12
Desai et al '18	VA Database	244	44%	1%	<0.001
Alemozaffar et al '14	Health Professionals Follow Up Study	903	30%	4%	<0.001
Forsmark et al '18	Prospective non-randomized cohort (LAPPRO)	2431	0.58	0.19	<0.001
Guazzoni et al '06	Randomized, one surgeon	120	54%	13%	<0.001

Complications

Study	Type	N	RRP	RARP	P Value
Yaxley et al '16	Randomized by surgeon A vs B	326	9%	4%	0.05
Desai et al '18	VA Database	244	37%	6%	<0.001
Guazzoni et al '06	Randomized, one surgeon	120	13%	10%	0.01

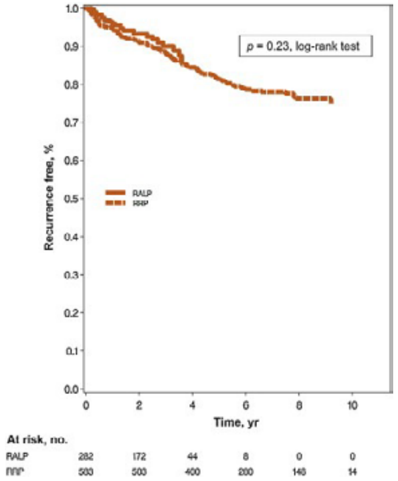
Length of Stay

Study	Type	N	RRP	RARP	P Value
Yaxley et al '16	Randomized by surgeon A vs B	326	3.3	1.6	<0.001
Desai et al '18	VA Database	244	3	2	<0.001
Alemozaffar et al '14	Health Professionals Follow Up Study	903	2.9	1.8	<0.001
Haglind et al '15	Prospective non-randomized cohort (LAPPRO)	2431	4	3	<0.001

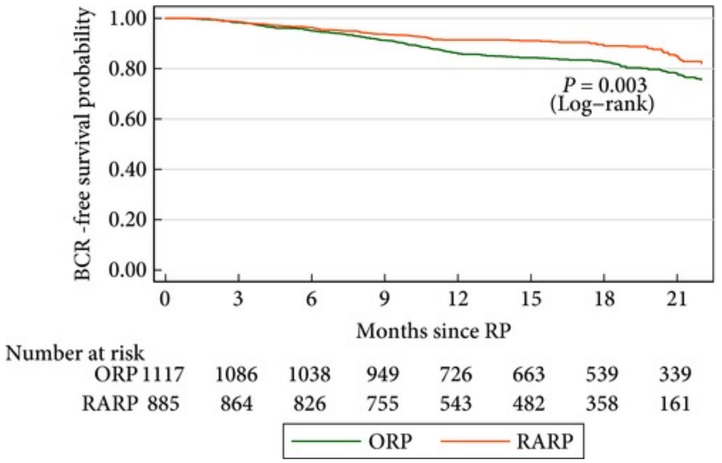
Operating Room Time (min)

Study	Type	N	RRP	RARP	P Value
Yaxley et al '16	Randomized surgeon A vs B	326	280	246	<0.001
Desai et al '18	VA Database	244	325	390	<0.001
Haglind et al '15	Prospective non-randomized cohort (LAPPRO)	2431	126	236	<0.001
Guazzoni et al '06	Randomized, one surgeon	120	170	235	<0.001

Recurrence Free Survival



Recurrence Free Survival



Outcomes of Functional Parameters with RARP

Series	Number of Patients	Positive Margin	Definition of Potency	Patients Achieving Potency	Definition of Continence	Patients Achieving Continence
Badani et al (2007)[11]	2766	12.0	Intercourse	79.2% at 12 mo	≤1 pad per day	93% at 12 mo
Ahlering et al (2004)[43]	140	12.3% (pT2)	Not reported	Not reported	No pads	76% at 3 mo
		48.8% (pT3)				
Patel et al (2003)	200	5.7% (pT2)	Not reported	Not reported	No pads	98% at 6 mo
		26.3% (pT3)				
Joseph et al (2003)	325	9.9% (pT2)	IIEF >21	68% at 6 mo	No pads	96% at 6 mo
		32.7% (pT3a)				

Yaxley et al 2016

	Baseline RRP	Baseline RALP	P Value	12 week RRP	12 week RALP	P Value
EPIC-Urinary Domain	88.8	88.5	0.83	83.8	82.5	0.48
EPIC-Sexual Domain	59.8	63.1	0.25	35.0	38.9	0.18
EPIC-Overall QOL	44.0	46.7	0.30	27.6	30.1	0.31

RARP vs Lap and Open RP: Functional outcomes 18 mos after diagnosis: a national Cohort study in UK *(Nossiter et al BJC 2018)*

- **Method:** all men diagnosed with Pca in England during April-October 2014 who received RP identified by the National PCA audit and mailed a questionnaire 18 months after diagnosis are part of this study. Functional domains were requested using Epic-26 domain scores , generic health Qol (HR QoL); EQ-5D-5L scores were estimated
- **Results :** 2219 men (77%) responded:
  1310 (59%) RARP
  487 (21.9%) LRP
  422 (19%) ORP.
  NO DIFFERENCE in all domains… a trend in higher sexual function scores for RARP

Indications for Robotic Radical Prostatectomy:

2022 eau Guidelines

European Association of Urology

- Patients at **intermediate PCA and life expectancy > 10 years:** perform LND If the estimate risk for positive LNs exceeds 5% (SR: Strong)
- Patients with **high risk localised Pca** and a live expectancy of > 10 years only as part of multi-modal therapy (SR: Strong).. Perform an e-PLND in these patients (SR Strong)
  Do not perform a frozen section of nodes during RP to decide wheter to proceed with or abondon, the procedure (SR: Strong)
- **Locally Advanced Pca** : Offer RP to higly selected patients with c T3b-T4N0 or any TN1 Pca only as part of multi-modal therapy (SR: strong)
  Perform an e-PLND in high-risk Pca (SR: Strong)
  Do not perform a frozen section of nodes during RP ….

General Guidelines for Active Treatment of Pca:
eau guidelines 2022

European Association of Urology

- ***Surgical treatment***
- Inform patients that no surgical approach (open, laparoscopic or **robotic** RP) has clearly shown superiority in terms of functional or onco results (SR: Weak)
- Perform an e-LND when a LND is deemed necessary (SR:Strong)
- Do not perform nerve sparing surgery when there is a risk of extracapsular extension (based on cT stage, ISUP grade, nomogram and mpMRI) (SR: Weak)

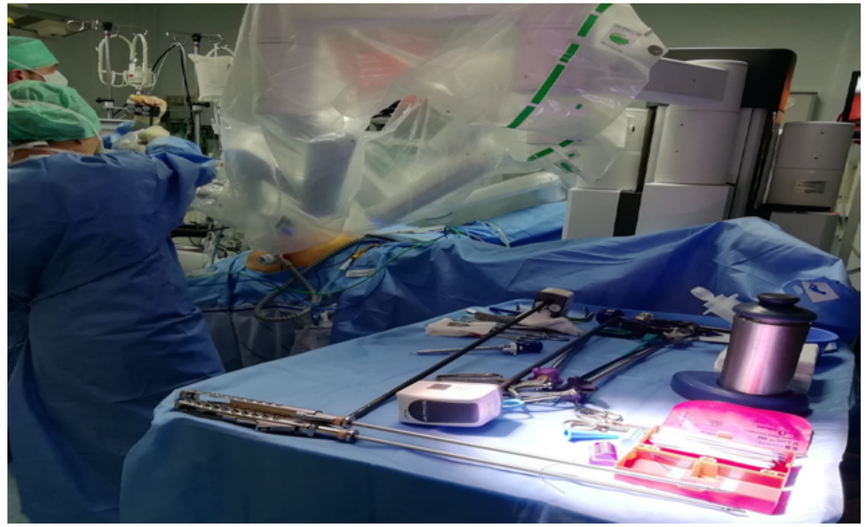
Relative Contraindications for Robotic Radical Prostatectomy

- Patients with previous peritoneal or pelvic surgery.
- Prior benign prostatic hyperplasia (BPH) surgery
- Large prostate size, pose technical challenges and increase operative times and blood loss during robotic radical prostatectomy.
- Morbid obesity
- Patients with important co-morbidities .. pulmonary
- Patients with GLAUCOMA (??)

Disadvantages of Robotic Techniques

- Economically, the robotic system is viable only for centers with a high volume of cases or multidisciplinary robotic use.
- The system cost exceeds $ 2 million, and the annual maintenance costs range from $150,000 to $250,000
- The minimum number of procedures needed per year to cover the expenses is 150
- **This disadvantage will disappear with the new coming Systems (less expensive)**

From 4 arms Da Vinci R…….. To



Hogo and Japanese R….and Single Port Robotic Surgery

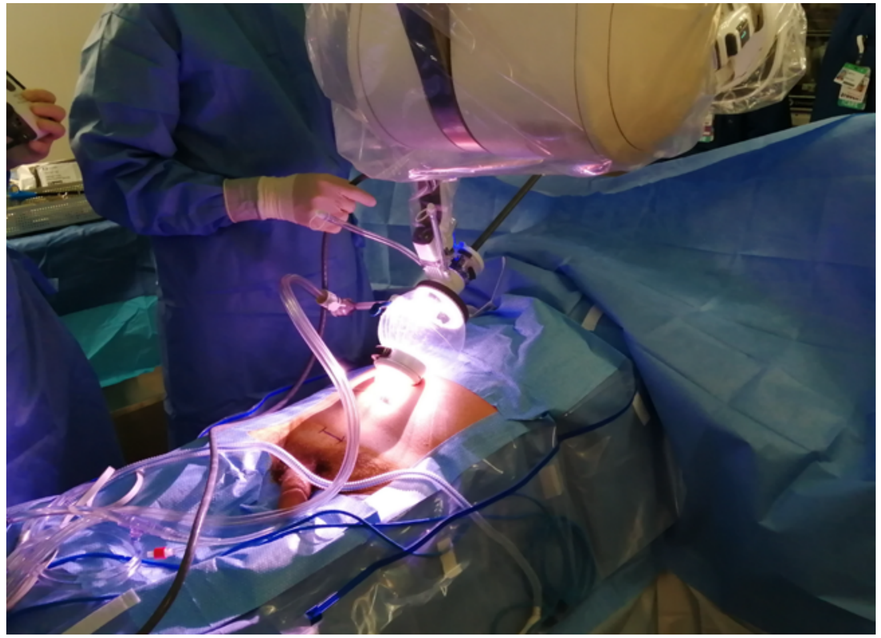
- **Not available in EUROPE**

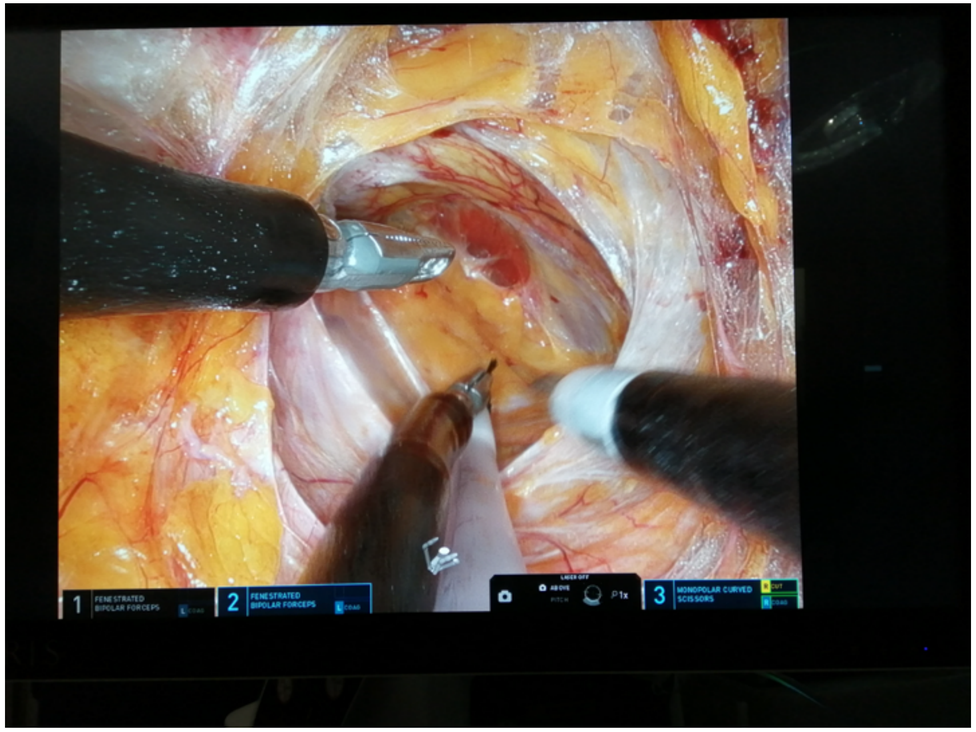
.....Future: HUGO Robot

HUGO Robot

Hugo Robot: 3D Vision

Da Vinci SP: Single Port (Chicago 2023)




1
FENESTRATED
BIPOLAR FORCEPS
2
FENESTRATED
BIPOLAR FORCEPS
3
MONOPOLAR CURVED
SCISSORS

Grazie

Delitti in materia di violazione del diritto d'autore (Art. 25-novies, D.Lgs. n. 231/2001) [articolo aggiunto dalla L. n. 99/2009]

- Messa a disposizione del pubblico, in un sistema di reti telematiche, mediante connessioni di qualsiasi genere, di un'opera dell'ingegno protetta, o di parte di essa (art. 171, legge n.633/1941 comma 1 lett. a) bis)
- Reati di cui al punto precedente commessi su opere altrui non destinate alla pubblicazione qualora ne risulti offeso l'onore o la reputazione (art. 171, legge n.633/1941 comma 3)
- Abusiva duplicazione, per trarne profitto, di programmi per elaboratore; importazione, distribuzione, vendita o detenzione a scopo commerciale o imprenditoriale o concessione in locazione di programmi contenuti in supporti non contrassegnati dalla SIAE; predisposizione di mezzi per rimuovere o eludere i dispositivi di protezione di programmi per elaboratori (art. 171-bis legge n.633/1941 comma 1)
- Riproduzione, trasferimento su altro supporto, distribuzione, comunicazione, presentazione o dimostrazione in pubblico, del contenuto di una banca dati; estrazione o reimpiego della banca dati; distribuzione, vendita o concessione in locazione di banche di dati (art. 171-bis legge n.633/1941 comma 2)
- Abusiva duplicazione, riproduzione, trasmissione o diffusione in pubblico con qualsiasi procedimento, in tutto o in parte, di opere dell'ingegno destinate al circuito televisivo, cinematografico, della vendita o del noleggio di dischi, nastri o supporti analoghi o ogni altro supporto contenente fonogrammi o videogrammi di opere musicali, cinematografiche o audiovisive assimilate o sequenze di immagini in movimento; opere letterarie, drammatiche, scientifiche o didattiche, musicali o drammatico musicali, multimediali, anche se inserite in opere collettive o composite o banche dati; riproduzione, duplicazione, trasmissione o diffusione abusiva, vendita o commercio, cessione a qualsiasi titolo o importazione abusiva di oltre cinquanta copie o esemplari di opere tutelate dal diritto d'autore e da diritti connessi; immissione in un sistema di reti telematiche, mediante connessioni di qualsiasi genere, di un'opera dell'ingegno protetta dal diritto d'autore, o parte di essa (art. 171-ter legge n.633/1941)
- Mancata comunicazione alla SIAE dei dati di identificazione dei supporti non soggetti al contrassegno o falsa dichiarazione (art. 171-septies legge n.633/1941)
- Fraudolenta produzione, vendita, importazione, promozione, installazione, modifica, utilizzo per uso pubblico e privato di apparati o parti di apparati atti alla decodificazione di trasmissioni audiovisive ad accesso condizionato effettuate via etere, via satellite, via cavo, in forma sia analogica sia digitale (art. 171-octies legge n.633/1941).

Torna all'inizio