

# **Minimally Invasive Surgical Approaches to prostate cancer**

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**University of South Florida**

**College of Medicine**

**Tampa-Florida, USA**

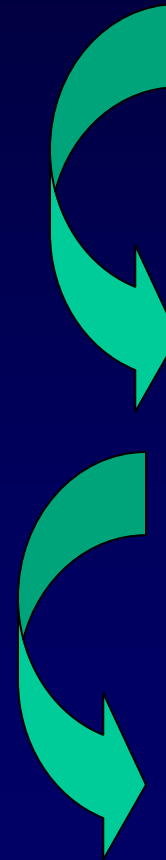
# What is minimally invasive surgery?

“Any procedure that is **less invasive** than open surgery used for the same purpose. Typically involves use of laparoscopic devices and/or remote-control manipulation of instruments with indirect observation of the surgical field through an endoscope or similar device, and are carried out through the skin or through a body cavity or anatomical opening.”

John EA Wickham British Medical Journal in 1987

# Laparoscopic Surgery

- Smaller incisions
- Better visibility
  - Better cancer surgery?
  - Less convalescence?
  - Quicker recovery?
- Improved QOL?
  - Potency
  - Continence



From

**LESS TO LEAST** INVASIVE  
SURGERY!!!

Incisionless

or

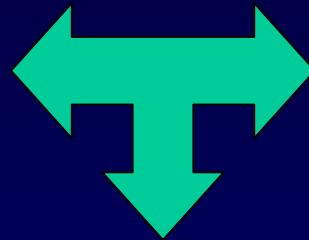
Single incision?



# Laparoscopic Radical Prostatectomy Evolution of Technique

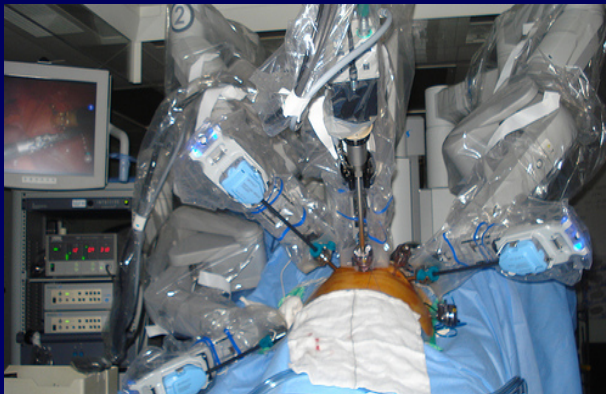
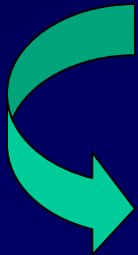
Intraperitoneal

Extraperitoneal

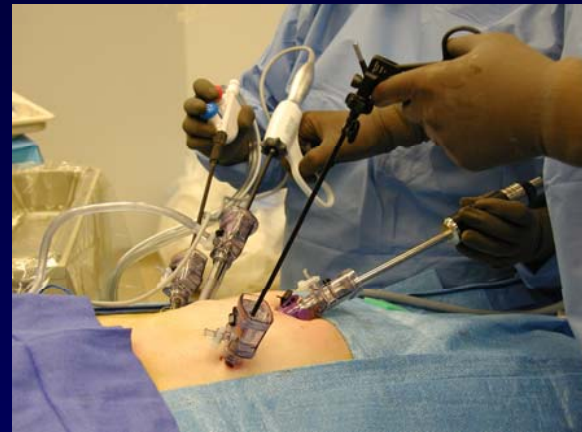


Robotic -assisted

Pure Laparoscopic



# Conventional Laparoscopy



# Newer Technologies Working Instruments

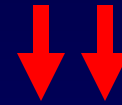


# Robotic-Assisted Laparoscopic Radical Prostatectomy



2 Functions:

- **3D vision**
- Articulation at tip: "Degrees of freedom"



• **Increased precision**

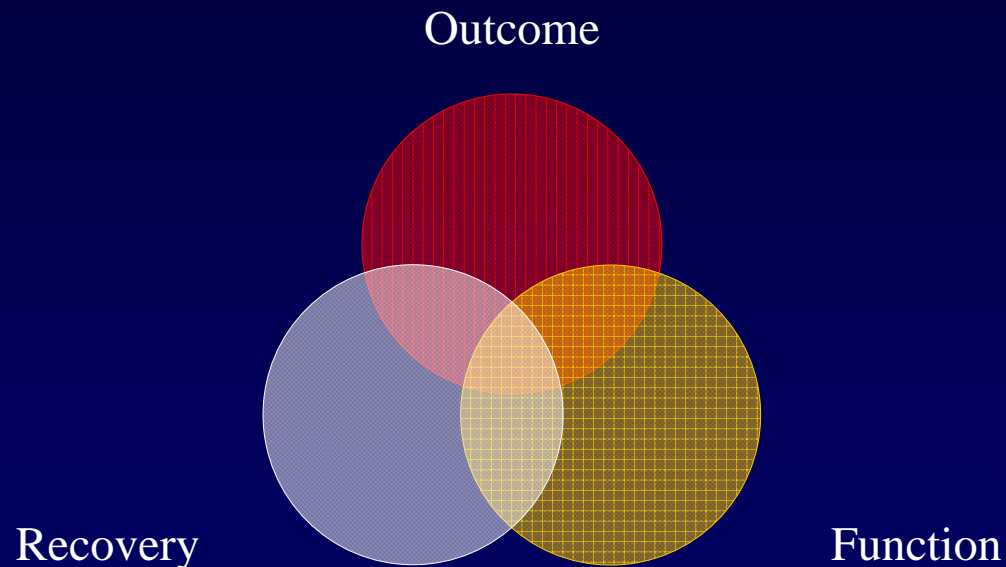
- Decreased learning curve ?
- Ergonomic?



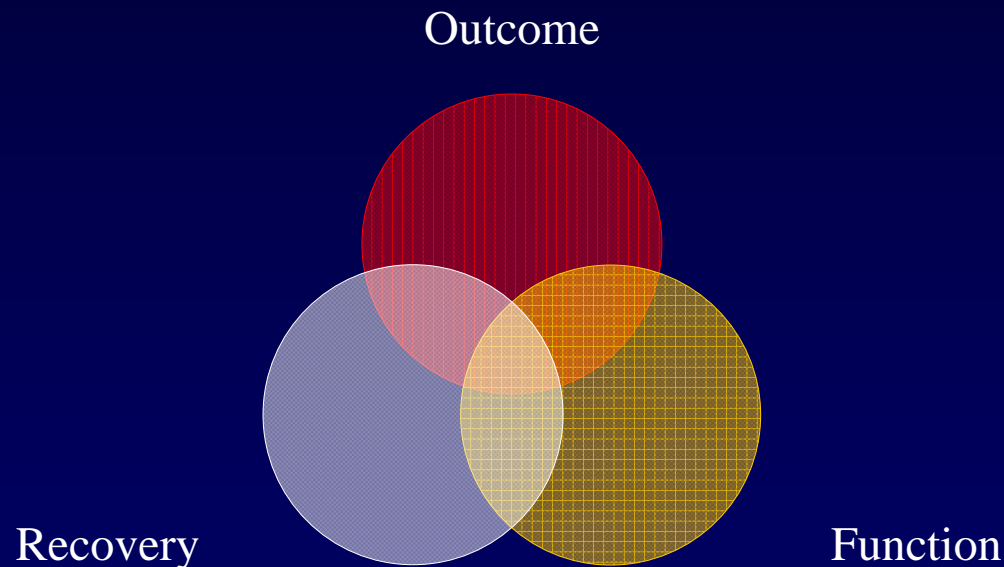
## Robotic-Assisted Laparoscopic Radical Prostatectomy Cost Analysis

- Initial cost, intermediate model: \$1,650,000
- Maintenance: 165,000/year
  - Fixed/year/5years \$400,714.28
  - Disposables: 1,500/case
- Institutional cost per patient based on volumes/year:
  - 50 \$ 9,514.28
  - 100 \$ 5,507.14
  - 200 \$ 3,503.57
  - 400 \$ 2,501.78
  - 600 \$ 2,167.85

Does Lap/Robotic assisted radical prostatectomy  
make a difference when compared with open  
radical prostatectomy?



Does Lap/Robotic assisted radical prostatectomy  
make a difference when compared with open  
radical prostatectomy?



**NO STUDY DEMONSTRATING  
BETTER RESULTS!!!**

PREDICTING BLOOD LOSS AND TRANSFUSION REQUIREMENTS  
DURING RADICAL PROSTATECTOMY: THE SIGNIFICANT NEGATIVE  
IMPACT OF INCREASING BODY MASS INDEX

SAM S. CHANG,\* DAVID T. DUONG, NANCY WELLS, EMILY E. COLE, JOSEPH A. SMITH, JR.  
AND MICHAEL S. COOKSON

*From the Departments of Urologic Surgery and Patient Care Services (NW), Vanderbilt University Medical Center, Nashville, Tennessee*

➤ 436 patients underwent open retropubic radical prostatectomy

Transfusion rate was **significantly increased** in

Overweight patients	<b>6.9%</b>	
Obese patients	<b>5.6%</b>	
Normal patients	1.9%	(p=0.009)



INFLUENCE OF BODY WEIGHT AND PROSTATE VOLUME  
ON INTRAOPERATIVE, PERIOPERATIVE, AND  
POSTOPERATIVE OUTCOMES AFTER RADICAL  
RETROPUBIC PROSTATECTOMY

ELIAS I. HSU, EUGENE K. HONG, AND HERBERT LEPOR

➤ 1024 men operated of open retropubic radical prostatectomy

Prostate volume was **significantly and directly related** to:

EBL p=0.02

Allogenic Transfusion rate p=0.01

Length of hospital stay p=0.01

## OBESITY AND CAPSULAR INCISION AT THE TIME OF OPEN RETROPUBIC RADICAL PROSTATECTOMY

STEPHEN J. FREEDLAND,\* KELLY A. GRUBB, SINDY K. YIU, MATTHEW E. NIELSEN,  
LESLIE A. MANGOLD, WILLIAM B. ISAACS, JONATHAN I. EPSTEIN AND ALAN W. PARTIN

*From The James Buchanan Brady Urological Institute (SJF, KAG, SKY, MEN, LAM, WBI, JIE, AWP) and Department of Pathology (JIE), The Johns Hopkins School of Medicine and Sidney Kimmel Comprehensive Cancer Center, Johns Hopkins Medical Institutions (WBI), Baltimore, Maryland*

➤ 7027 men treated of RRP

**BMI was positively related to capsular incision**

Open retropubic radical prostatectomy is technically more difficult in obese men

# LRP can be performed safely in patients with high BMI and large prostates

0022-5347/05/1732-0442/0  
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Printed in U.S.A.  
DOI: 10.1097/01.ju.0000148865.89309.cb

## LAPAROSCOPIC RADICAL PROSTATECTOMY AND BODY MASS INDEX: AN ASSESSMENT OF 151 SEQUENTIAL CASES

JAMES A. BROWN,\*† DAVID M. RODIN,\* BENJAMIN LEE AND DOUGLAS M. DAHL

*From the Department of Urology, Massachusetts General Hospital and Harvard Medical School, Boston, Massachusetts*

**BUT: Only 50 were obese in this series**

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Vol. 173, 552–554, February 2005  
Printed in U.S.A.  
DOI: 10.1097/01.ju.0000150101.95236.35

## IMPACT OF PROSTATE SIZE AND BODY MASS INDEX ON PERIOPERATIVE MORBIDITY AFTER LAPAROSCOPIC RADICAL PROSTATECTOMY

AMAR SINGH, RANDY FAGIN, GAURANG SHAH AND BIJAN SHEKARRIZ\*

*From the Department of Urology, Upstate Medical University, Syracuse, New York*

**BUT: 22 were obese and 17 had prostate weight (PW) > 50 gms)**

# IMPACT OF OBESITY ON CLINICAL OUTCOMES IN ROBOTIC PROSTATECTOMY

THOMAS E. AHLERING, LOUIS EICHEL, ROBERT EDWARDS, AND DOUGLAS W. SKARECKY

TABLE III. Perioperative and postoperative data for obese and nonobese groups

Variable	BMI >30	SE	BMI <30	SE	P Value
Operative time (min)	295.8 (186–645)	13.2	236.1 (160–490)	4.6	0.04
Estimated blood loss (mL)	183 (50–400)	24.9	105 (25–350)	8.6	0.007
POD 1 Hb change (g/dL)	1.5 (–0.1 to +3.0)	0.8	1.6 (–0.2 to +3.4)	0.8	0.72
Hospital stay (hr)	41 (18–96)	4.9	28.4 (18–168)	2.4	0.09
Prostate size (g)	62.4 (21.8–163)	7.9	49.5 (12.5–135)	2.4	0.14
Total complications (%)	5/19 (26.3)	0.10	4/81 (4.9)	0.02	0.01*
Return to work/usual activities (wk)	7.0	2.4	4.3	1.0	0.09
Continence at 6 mo (0 pads) (%)	9/19 (47)	0.13	74/81 (91)	0.03	≤0.001*
Urinary bother score at 3 mo	3.3 (0–6)	0.6	1.8 (0–5)	0.2	0.003
Urinary bother score at 9 mo	3.2 (1–6)	0.6	1.6 (0–3)	0.2	0.04
Voided volume at 3 mo (mL)	214 (54–384)	34.8	379 (39–929)	26.5	0.011

Key: BMI = body mass index; POD = postoperative day; Hb = hemoglobin; SE = standard error.  
 Data presented as mean, with range in parentheses, unless otherwise noted.  
 \* Two-sided Fisher's exact test.

BUT: Based on only 19 patients!!!



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 \* Two-sided Fisher's exact test.

BUT: Based on only 19 patients!!!

## Laparoscopic Extraperitoneal Radical Prostatectomy in Complex Surgical Cases

Alejandro R. Rodriguez,\* Rachna Kapoor and Julio M. Pow-Sang\*

*From the Department of Interdisciplinary Oncology, Division of Genitourinary Oncology (ARR, JMPS) and Division of Biostatistics (RK), H. Lee Moffitt Cancer Center and Research Institute, University of South Florida, Tampa, Florida*

Jan 2004 – May 2006

300 patients underwent LERP

- BMI stratified into groups I (<30), II (30-35), III (36-40), IV (>40)
- PW stratified into groups I (<20), II (20-40), III (41-60), IV (>60)
- Previous lower abdominal or prostatic surgery or no previous surgery.

Groups were assessed for differences in  
Intraoperative, perioperative, and pathological outcomes

A.R. Rodriguez et al. J Urol 2007; 177:1765-1770

# BMI

## Comparison of Groups

BMI ( mean )	# of Pts	Age	PSA	Biopsy Gleason	Specimen Gleason	Prostate Weight grams	% of cancer	OR time	EBL	Hosp days	JP days	Foley days	Margins +
<30 (26)	196	60	5.8	6.3	6.5	48	12%	255	487	2.3	2.4	17	23%
>30 (34)	84	57	6.1	6.3	6.5	48	33%	263	543	2.4	2.7	18	32%

# BMI

## Comparison of Groups

BMI ( mean )	# of Pts	Age	PSA	Biopsy Gleason	Specimen Gleason	Prostate Weight grams	% of cancer	OR time	EBL	Hosp days	JP days	Foley days	Margins +
<30 (26)	196	60	5.8	6.3	6.5	48	12%	255	487	2.3	2.4	17	23%
>30 (34)	84	57	6.1	6.3	6.5	48	33%	263	543	2.4	2.7	18	32%

# RESULTS

- BMI did not have an impact on biopsy Gleason score, PSA, O.R. time, blood loss, transfusion rate, JP drainage, bladder catheterization, hospital stay, Gleason score ( $p=0.98$ ) and margins ( $p=0.09$ )
- BMI directly correlated with % of tumor in specimen ( $p=0.046$ )

Presented: SESAUA March 2006

EUA Paris April 2006

Published: J Urol May 2007

# Prior lower abdominal or prostatic surgery

95 (34%) patients

- open inguinal hernia (41)
- Appendectomy (27)
- inguinal hernia with mesh (17)
- umbilical hernia (3)
- TURP (5)
- TUNA (1)
- Pubic bone fixation (1)



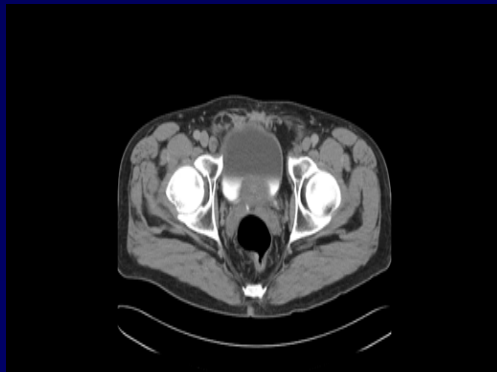
➤ **No significant impact on operative and perioperative and pathological parameters**

Presented: EUA Paris April 2006

# Prostate weight

## Comparison of groups

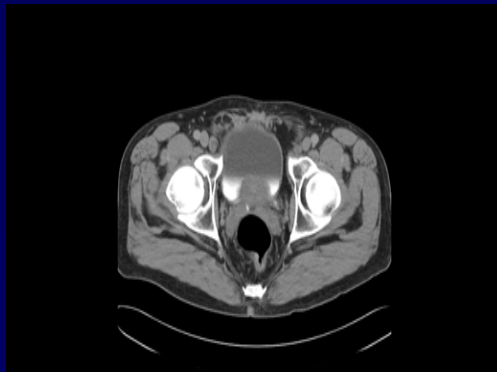
Groups	Prostate Weight grams ( mean )	# of Pts	Age	BMI	PSA	Biopsy Gleason	Specimen Gleason	% of cancer	OR time	EBL	Hosp days	JP days	Foley days	Margins +
I	< 20 (17)	5	58	31	4.6	6.2	6.4	13%	258	<b>340</b>	1.4	2.4	14.4	<b>40%</b>
II	20-40 (31)	89	58	28	5.5	6.4	6.7	15%	272	<b>478</b>	2.1	2.5	15.7	<b>34%</b>
III	40-60 (48)	134	58	29	5.7	6.2	6.5	24%	250	<b>501</b>	2.5	2.4	18	<b>25%</b>
IV	> 60 (81)	52	63	28	7.4	6.3	6.5	10%	248	<b>565</b>	2.4	3	19	<b>13%</b>



# Prostate weight

## Comparison of groups

Groups	Prostate Weight grams (mean)	# of Pts	Age	BMI	PSA	Biopsy Gleason	Specimen Gleason	% of cancer	OR time	EBL	Hosp days	JP days	Foley days	Margins +
I	< 20 (17)	5	58	31	4.6	6.2	6.4	13%	258	340	1.4	2.4	14.4	40%
II	20-40 (31)	89	58	28	5.5	6.4	6.7	15%	272	478	2.1	2.5	15.7	34%
III	40-60 (48)	134	58	29	5.7	6.2	6.5	24%	250	501	2.5	2.4	18	25%
IV	> 60 (81)	52	63	28	7.4	6.3	6.5	10%	248	565	2.4	3	19	13%





# Results

## Significant Impact

- Prostate weight directly correlated with higher blood loss ( $p=0.049$ ), but did not affect transfusion rate.
- Larger prostates had a lower probability of a positive margin ( $p=0.03$ )

Presented: SESAUA March 2006

EAU Paris April 2006

Published: J Urol May 2007

# Outcomes

- ✓ LERP can be performed in complex surgical patients without increased intra and perioperative morbidity.
- ✓ During LERP prostate weight was directly correlated with an increased EBL, but did not affect transfusion rate.
- ✓ Obese patients may have a higher % of tumor in the specimen that might increase the risk of + margins, however in LERP the + margins were not affected.

Presented: SESAUA March 2006  
EAU Paris April 2006  
Published: J Urol May 2007

# Robotic assisted radical prostatectomy has matched the results in complex surgical cases!

## ROBOTIC-ASSISTED LAPAROSCOPIC PROSTATECTOMY IN OVERWEIGHT AND OBESE PATIENTS

ALBERT A. MIKHAIL, BENJAMIN R. STOCKTON, MARCELO A. ORVIETO, GARY W. CHIEN, EDWARD M. GONG, KEVIN C. ZORN, CHARLES B. BRENDLER, GREGORY P. ZAGAJA, AND ARIEH L. SHALHAV

**BJUI**  
BJUI INTERNATIONAL

Does a history of previous surgery or radiation to the prostate affect outcomes of robot-assisted radical prostatectomy?

Aaron D. Martin, Premal J. Desai, Rafael N. Nunez, George L. Martin, Paul E. Andrews, Robert G. Ferrigni, Scott K. Swanson, Anna Pacelli\* and Erik P. Castle

*Departments of Urology and \*Pathology, Mayo Clinic, Phoenix, AZ, USA*

Accepted for publication 4 September 2008

What are the real learning curves of pure laparoscopic and robotic assisted radical prostatectomy?



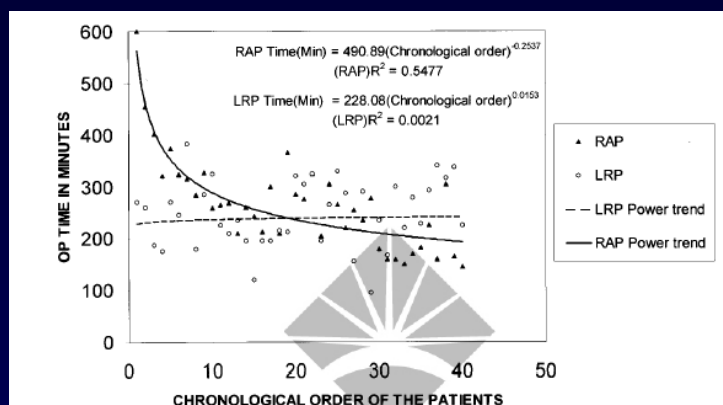
# Laparoscopic Prostatectomy Learning Curve

- Previous laparoscopic experience
  - Yes: "40-60 cases"
  - No: "80-100 cases"

Guillonneau Urol. Clin. NA 2001, 20:189

Kavoussi Urol. 2001, 58:503

# Robotic Assisted Laparoscopic Prostatectomy



“18 RLP to surpass LRP.”

Menon JU Sept. 2002 168:945

...One of us (MM) “Untrainable”

Menon Urol.Clin NA Nov.2004 31:701

---

“8-12 RLP for proficiency (<4hours) comparable to

Pure LP laparoscopist with more than 100 case-experience”

Ahlering JU Nov. 2003 170:1738

---

“RALP results comparable to those obtained routinely with RRP were not achieved until after > or = 150 procedures. Surgeon comfort and confidence comparable to that with RRP did not occur until after 250 RALP procedures.”

Herrell, Smith Urology 2005 Nov;66(5 Suppl):105

# Laparoscopy and Robotics

## Robot-Assisted Laparoscopic Prostatectomy: A Single-Institutions Learning Curve

Jamison Jaffe, Sean Castellucci, Xavier Cathelineau, Justin Harmon, François Rozet,  
Eric Barret, and Guy Vallancien

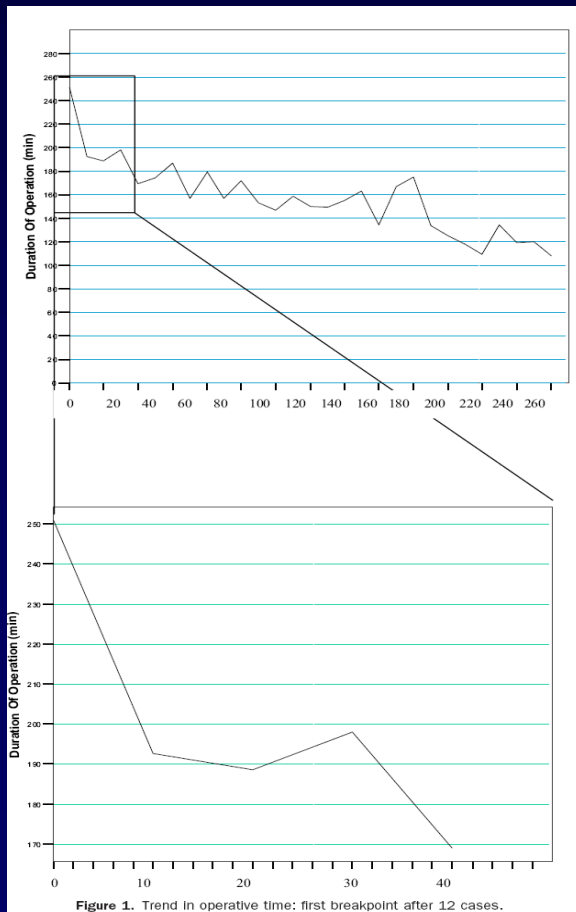


Figure 1. Trend in operative time: first breakpoint after 12 cases.

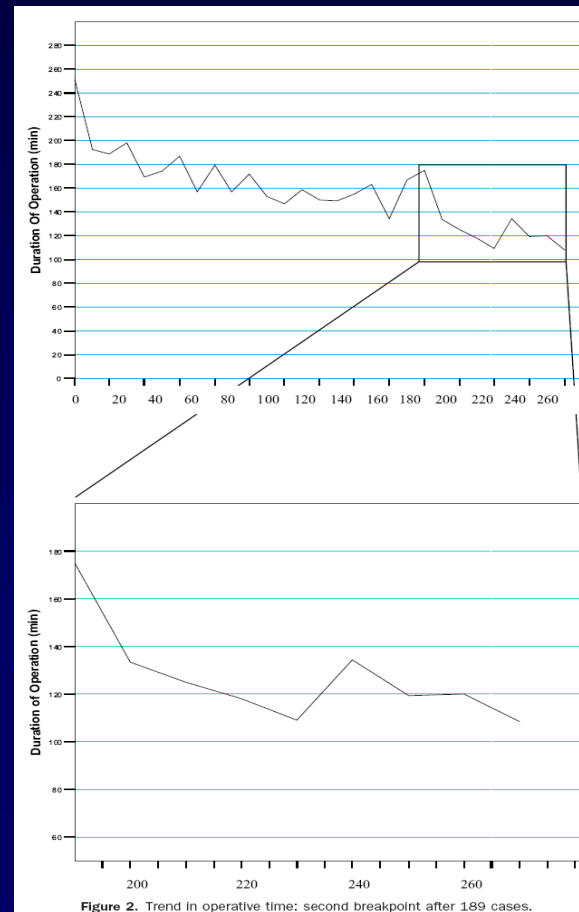


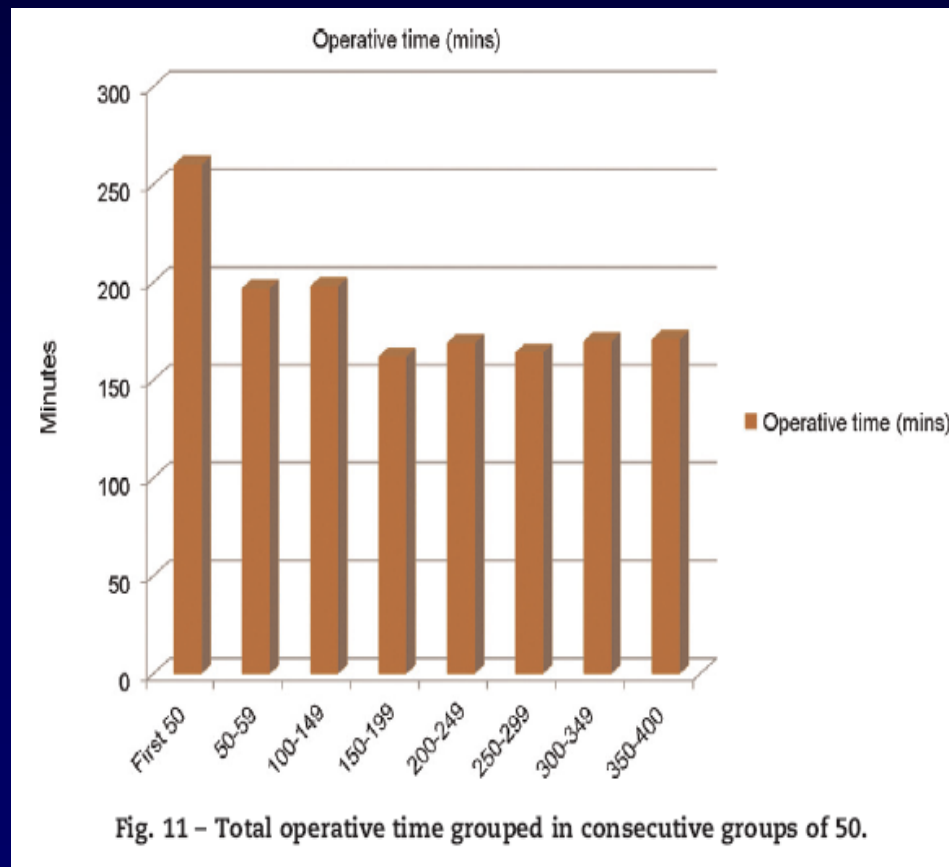
Figure 2. Trend in operative time: second breakpoint after 189 cases.

Surgery in Motion

**Operative Details and Oncological and Functional Outcome of Robotic-Assisted Laparoscopic Radical Prostatectomy: 400 Cases with a Minimum of 12 Months Follow-up**

Declan G. Murphy \*, Michael Kerger, Helen Crowe, Justin S. Peters, Anthony J. Costello

Department of Urology, Epworth Hospital, Richmond, & Royal Melbourne Hospital, Australia





Surgery in Motion

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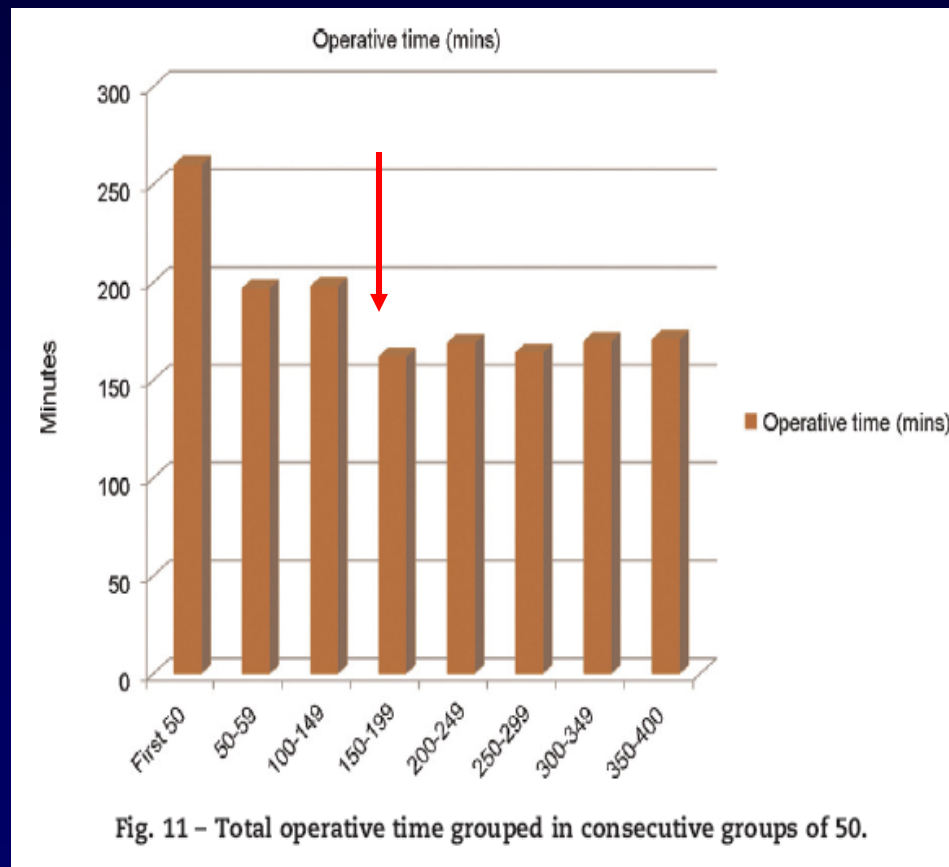
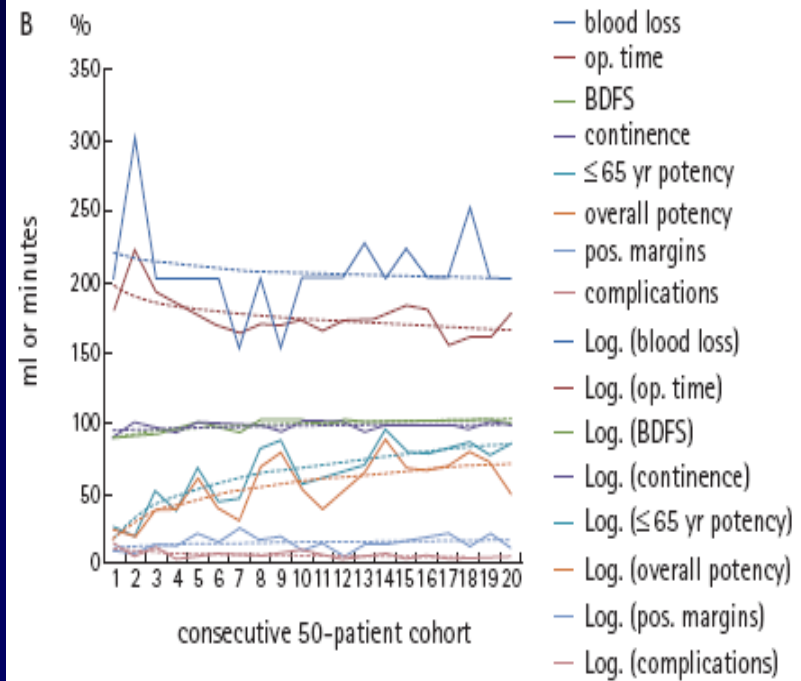
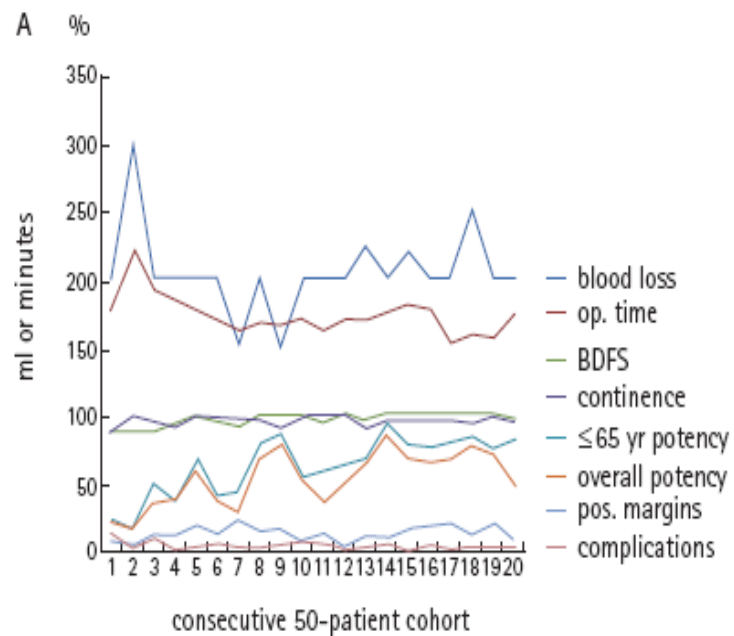


Fig. 11 - Total operative time grouped in consecutive groups of 50.

# The first 1000 cases of laparoscopic radical prostatectomy in the UK: evidence of multiple 'learning curves'

Christopher G. Eden, Mischel G. Neill and Mark W. Louie-Johnsun  
Department of Urology, The Royal Surrey County Hospital, Guildford, UK

FIG. 1. The overall learning curves (A) and with computer-generated trend lines



# LRP Technical Skills

---

1. Develop extraperitoneal space/Trocar placement
2. Lateral planes
3. DVC control
4. Bladder neck excision
5. Vasa deferentia and SVs dissection
6. Denonvillier's fascia and posterior plane
7. Pedicles control and NVBs preservation
8. Urethral transection and prostate removal
9. Vesico-urethral anastomosis
10. Closing

**A.R. Rodriguez and J.M. Pow-Sang,  
EAU, Berlin 2007**

## **Abstract 931**

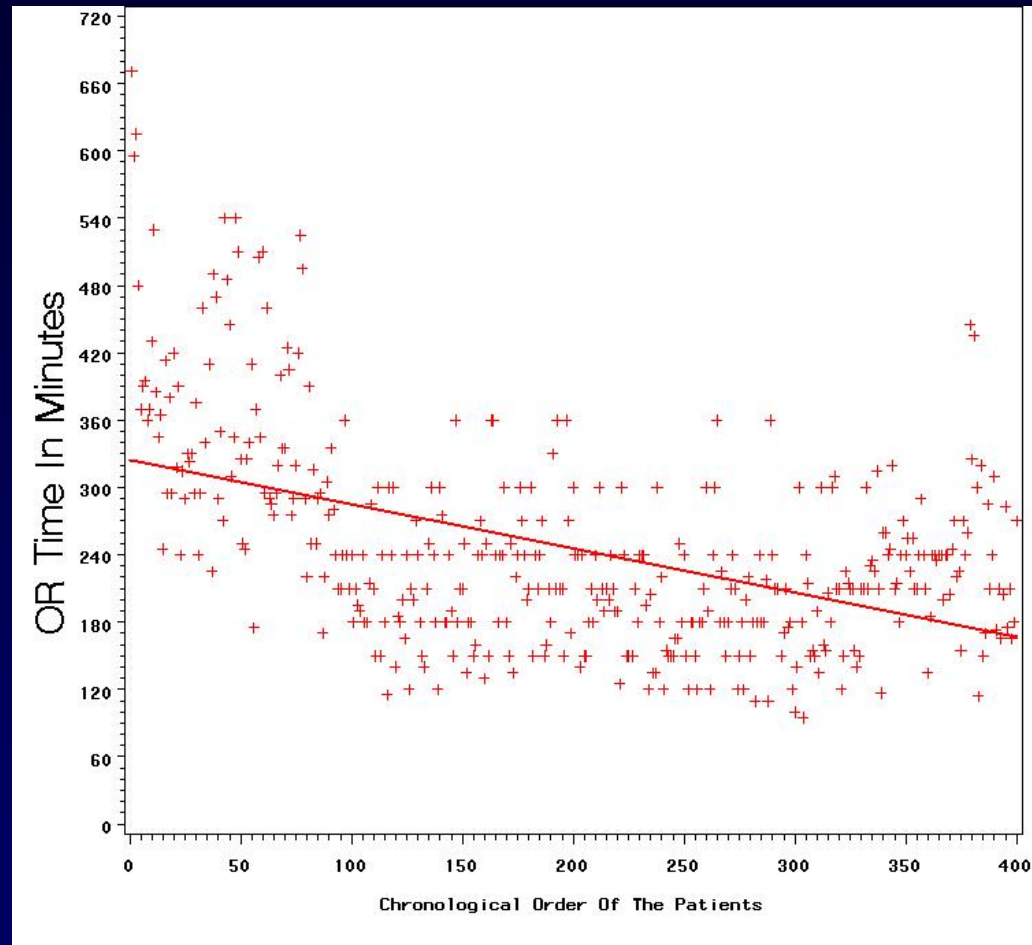
### LRP Training Results

---

• S.M.	20
• A.R*	10
• D.B.	25
• M.W.	25
• A.M.	25
• C.W	15
• C.P	15

**Mean # of cases = 20**

# 400 patients from Jan 2004 to Oct. 2006 Operative Times

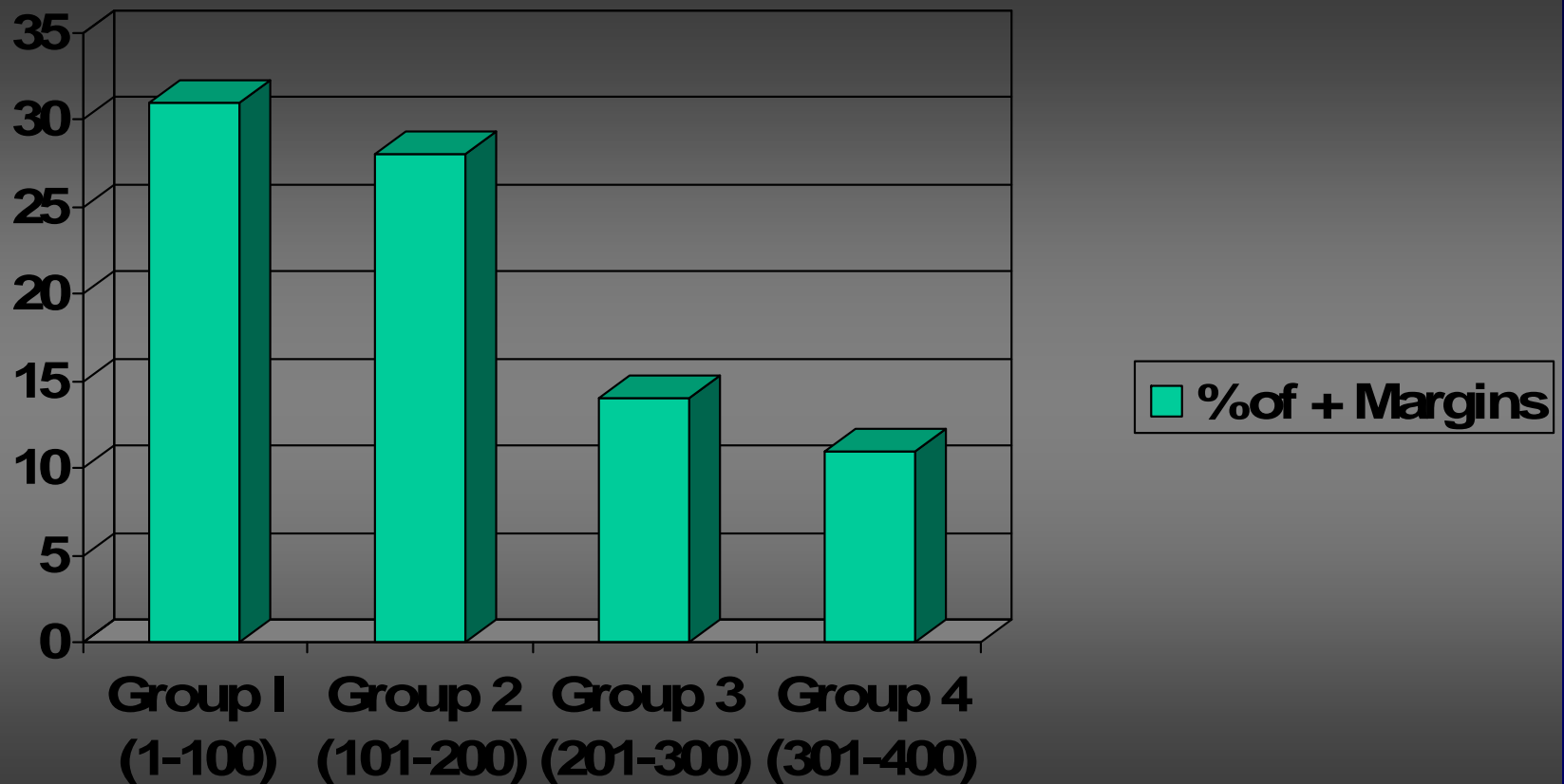


SESAUA March 2009

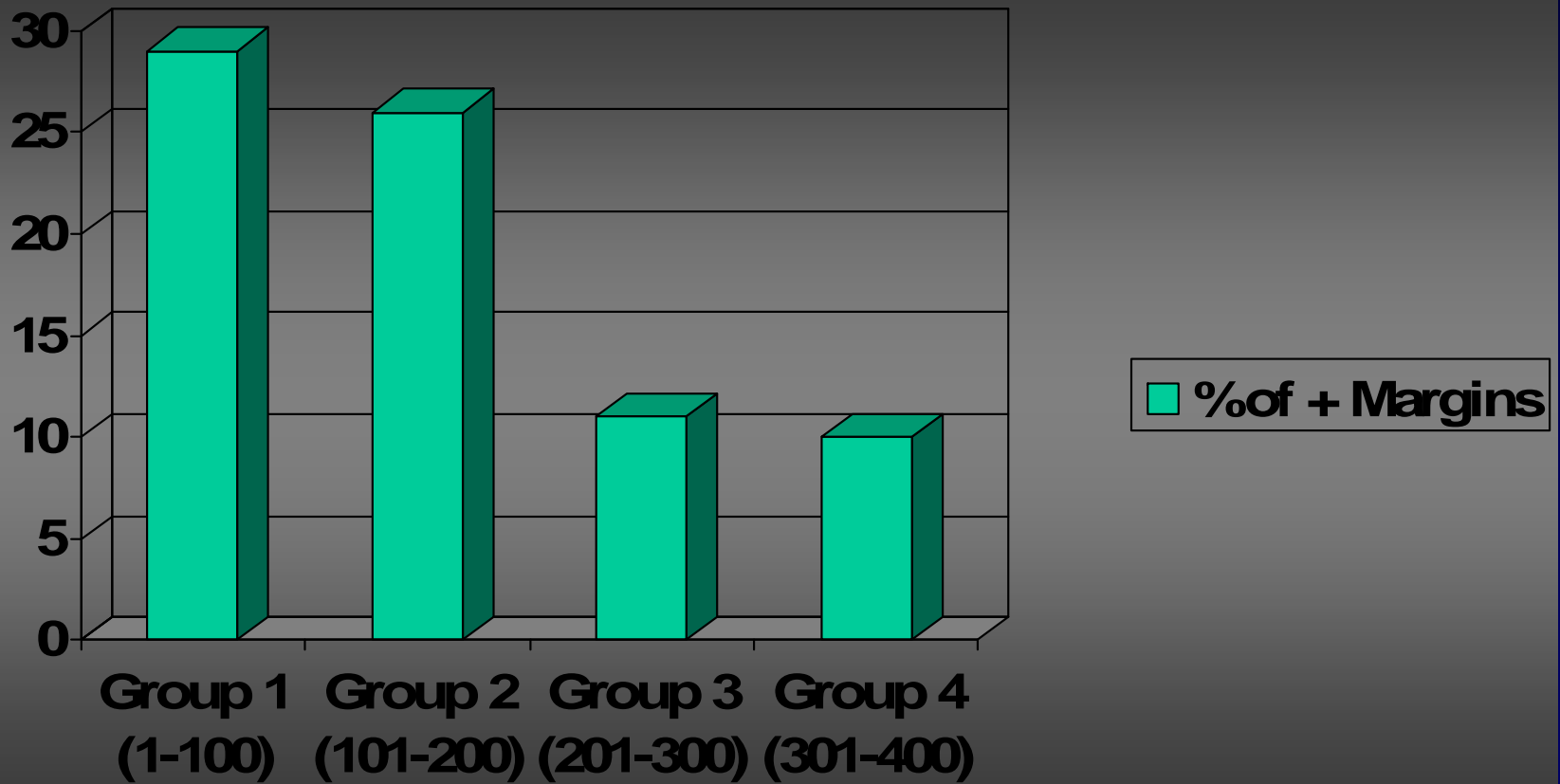
# The whole series

## % of + Margins by groups of patients

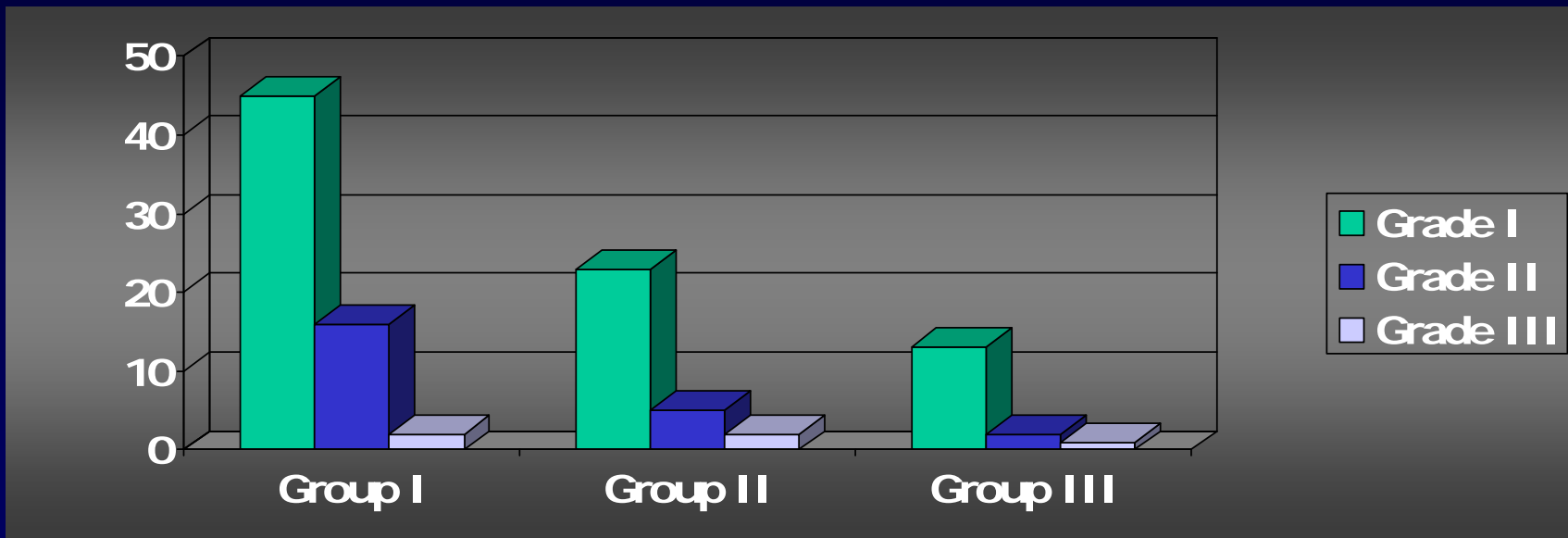
### Learning curve



pT2a-c Nx/N0  
% of + Margins by groups of patients  
Learning curve



# Complications



SESAUA March 2009

## Prostate Cancer

### Risk-Adjusted Analysis of Positive Surgical Margins Following Laparoscopic and Retropubic Radical Prostatectomy

Karim Touijer<sup>a</sup>, Kentaro Kuroiwa<sup>a</sup>, James A. Eastham<sup>a</sup>, Andrew Vickers<sup>a,b</sup>, Victor E. Reuter<sup>c</sup>, Peter T. Scardino<sup>a</sup>, Bertrand Guillonneau<sup>a,\*</sup>

<sup>a</sup> Department of Urology, Memorial Sloan-Kettering Cancer Center, New York, NY, United States

<sup>b</sup> Department of Epidemiology and Biostatistics, Memorial Sloan-Kettering Cancer Center, New York, NY, United States

<sup>c</sup> Department of Pathology, Memorial Sloan-Kettering Cancer Center, New York, NY, United States

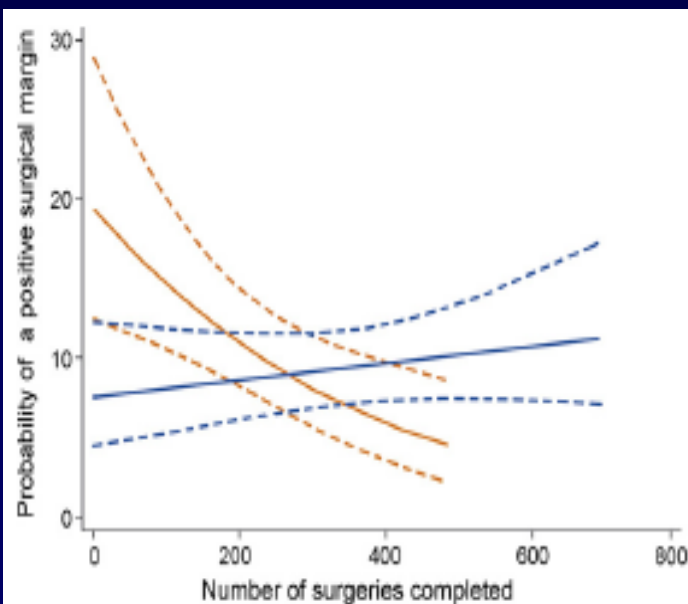


Fig. 2 - Evolution over time of the overall positive surgical margin rate (PSM) for each surgical approach. Blue line: open radical prostatectomy; orange line: laparoscopic radical prostatectomy; dotted lines: 95% confidence



# Functional Outcomes?

## Defining and Reporting Erectile Function Outcomes After Radical Prostatectomy: Challenges and Misconceptions

John P. Mulhall\*,†

*From the Sexual and Reproductive Medicine Program, Urology Service, Memorial Sloan Kettering Cancer Center, New York, New York*

### Minimal Requirements for Adequate Reporting of Erectile Function Outcomes After Radical Prostatectomy

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*It is recommended that investigators report*

Patient comorbidity profile

Degree to which patient selection was exercised

Who collected the erectile function outcome data

Which validated questionnaires were utilized

Baseline erectile function data

Long-term (24 month) erectile function data

Definition of adequate erectile function

Proportion of men returning to normal

Proportion of men returning to preoperative erectile function level

Extent of utilization of erectogenic medications

Extent to which a rehabilitation strategy was used

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# Lap/Robotic-Assisted Radical Prostatectomy

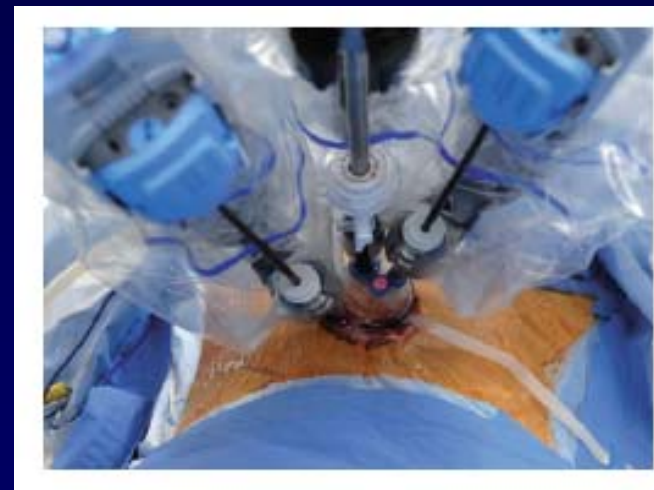
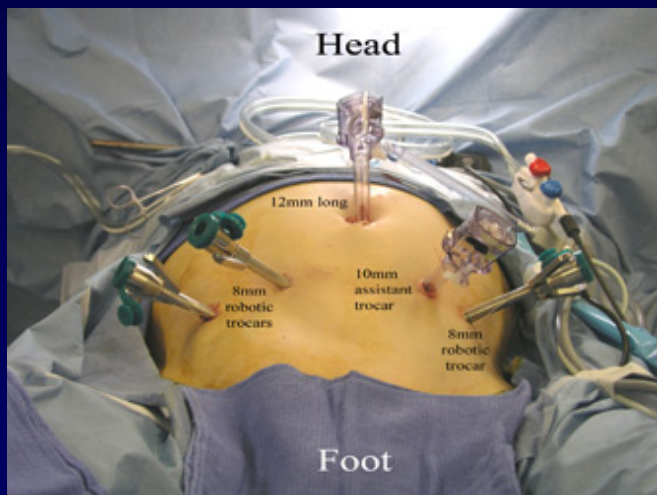
## CONCLUSIONS

- Oncologic and functional outcomes similar to Open Radical Prostatectomy (1,2)
- Can be performed in
  - Obese patients,
  - Large prostates
  - Patients with previous pelvic surgery
- Rapid worldwide implementation of robotic systems despite high costs
- Is there really a shorter learning curve with robotics?

1. Patel VR et al, J Endourol Oct 2008

2. Touijer K et al, J Urol May 2008

However, the REALITY is that  
Laparoscopic techniques and  
Robotic technology were born to be  
together!



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Robotic single-port transumbilical surgery in  
humans: initial report

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