

Suggested Urology Training Curriculum for the RobotiX Mentor

Description

Training within a proficiency-based virtual reality curriculum may reduce errors during real surgical procedures. The following curriculum is divided into two components:

The first component includes basic dissection and suturing skills and based on [Validation of the RobotiX Mentor Robotic Surgery Simulator \(J Endourol. 2016 Jan 21.\)](#). This component is intended for an individual to acquire skills and reach a predetermined level of proficiency before progressing to more challenging cases. The first task, puzzle piece dissection, was developed by The Fundamentals of Robotic Surgery Curriculum (FRS).

The second component of the curriculum is based on the Robotic Assisted Radical Prostatectomy (RARP) Simulation Module. The learner is taken step-by-step through three key procedural tasks: Bladder Neck Dissection, Dissection of Lateral Pedicles and Neurovascular Bundle (Nerve Sparing) and Urethrovesical Anastomosis. The curriculum provides a comprehensive educational solution including interactive step-by-step procedural guidance, anatomy identification, video-based curriculum and comprehensive performance reports. The module is developed in collaboration with Karolinska Training Centre (KTC), with the goal to provide a robotic simulation curriculum with construct and predictive validity. Curriculum validation will be achieved by having advanced surgical trainees (fellows) follow the curriculum, after which their performance in complex multi-step robotic surgeries, starting with RARP, will be evaluated using various assessment tools. Karolinska Training Centre have acquired the simulator, use it in their current training courses and are in the process of validating it.

In an optional team training component, the LAP Mentor Express can be incorporated to simulate a laparoscopic assistant within the procedural cases.

Objectives

The Fundamentals of Robotic Surgery Curriculum (FRS) Puzzle Piece Dissection Task Objectives:

- To safely and precisely perform fine dissection without damaging the surrounding or the underlying structures.

Suturing Exercises Objectives:

- Demonstrate basic techniques for knot tying across a vertical and horizontal defects using wristed instrumentation.
- Practice techniques to complete a continuous or running suture using wristed instruments.

Robotic Radical Prostatectomy:

- To perform appropriate bladder neck dissection and transection, maintaining the correct dissection plane avoiding the trigone and prostate.
- To control the prostatic vascular pedicles and dissect the neurovascular bundles from the pedicles along the lateral border of the prostate to the apex.
- To dissect the vas deferens and seminal vesicles, open the Denonvillier's fascia and dissect posterior to the prostate avoiding the rectum.
- To complete the apical dissection and urethral transection with preservation of urethral length but without entering the prostate.
- To perform a running urethrovesical anastomosis.
- In team training case – to practice the different roles of the surgical assistant: suction/irrigation, traction and clip applying.
- In team training case – to show effective communication between the robotic surgeon and the surgical assistant.

Specialties:

- Urology.

Target Audience:

Practicing physicians, as well as residents/fellows, interested in hands-on simulation-based training for the Robotic Radical Prostatectomy procedure.

Assumptions:

- It is recommended to include a cognitive skills module at the front end of the training program.
- Familiarity with basic robotic surgery skills and basic urology procedures.

Suggested Time Length

Suitable for 2 day training courses or for distributed training.

Authors:

The Puzzle Piece Dissection is a part of The Fundamentals of Robotic Surgery Curriculum (FRS) conducted by Institute for Surgical Excellence. Florida Hospital Nicholson Center. Principal Investigators: R.M. Satava, University of Washington School of Medicine, Seattle, WA. R.D. Smith, Florida Hospital Nicholson Center, Celebration, FL. V.R. Patel, Florida Hospital, Global Robotics Institute, Celebration, FL.

The recommended basic training curriculum for the RobotiX Mentor was developed by: George Whittaker¹, Abdullatif Aydin², Nicholas Raison², Francesca Kum³, Benjamin Challacombe³, Muhammed Shamim Khan^{2,3}, Prokar Dasgupta^{2,3}, and Kamran Ahmed^{2,3}.

¹*School of Medical Education, King's College London, London, United Kingdom.*

²*MRC Centre for Transplantation, King's College London, London, United Kingdom.*

³*Department of Urology, Guy's and St. Thomas' NHS Foundation Trust, London, United Kingdom.*

The Robotic Radical Prostatectomy Module was developed in Collaboration with:

- Peter Wiklund, MD, Professor of Urology, Chairman, Department of Molecular Medicine and Surgical Sciences, Karolinska Institute, Sweden.
- Justin Collins, MD, Department of Molecular Medicine and Surgery, Section of Urology, Karolinska Institute, Sweden.
- Trushar Patel, MD, Director, Robotic Urologic Surgery, Florida Hospital, Tampa, Florida.
- Shay Golan, MD, Urologic Oncology Fellow, Section of Urology, The University of Chicago Medicine, Chicago, United States.
- Andrei Nadu, MD, Director of Laparoscopic Urology Department, Rabin Medical Center, Israel.

Task Descriptions and Curriculum Steps

1. Dissection and Suturing Skills

Task 5: Puzzle Piece Dissection



Objectives:

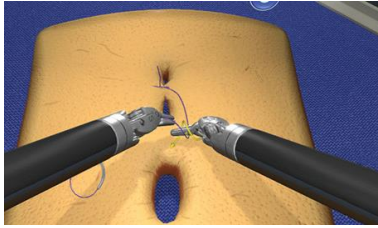
- To safely and precisely perform fine dissection without damaging the surrounding or the underlying structures.

Required skill level:

Total time (s)	480
No. of instrument collisions	9
Distance by camera	485
Path length (L+R)	10500
Number of cuts > 2mm deep	< 30

2. 4 Robotic Suturing Tasks

Vertical Defect Suturing



Objectives

Demonstrate basic techniques for knot tying across a vertical defect using wristed instrumentation.

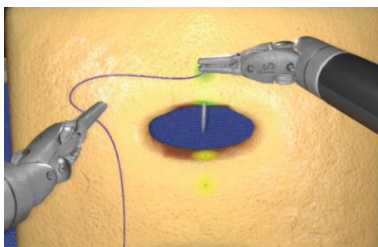
Tasks

Tie two knots at the indicated locations, follow the on-screen icons for guidance.

Required skill level:

Total time (s)	215
Number of unnecessary needle piercing points	7
Excessive force – suture breakage	0
Knot tail length deviation	30
Time needle is out of view (s)	4
Percentage of accurate needle passages	97%
Total number of knots	2

Horizontal Defect Suturing



Objectives

Demonstrate basic techniques for knot tying across a horizontal defect using wristed instrumentation.

Tasks

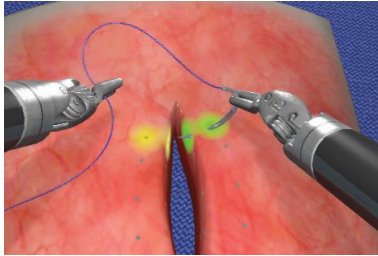
Tie two knots at the indicated locations, follow the on-screen icons for guidance.

Required skill level:

Total time (s)	215
Number of unnecessary needle piercing points	5
Excessive force – suture breakage	0
Knot tail length deviation	25

Time needle is out of view	3
Percentage of accurate needle passages	97%
Total number of knots	2

Continuous Suturing



Objectives

Practice techniques to complete a continuous or running suture using wristed instruments.

Tasks:

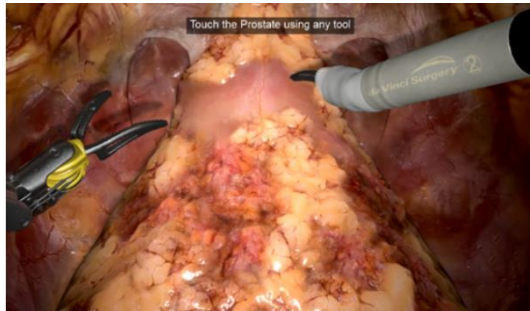
1. Tie a knot at the first position as an anchor for your suture.
2. Approximate the simulated tissue using a continuous, or running, suture through the indicated targets.

Required skill level:

Total time (s)	250
Number of unnecessary needle piercing points	12
Excessive force – suture breakage	0
Knot tail length deviation	10
Time needle is out of view (s)	15
Percentage of accurate needle passages	97%
Total number of knots	1

3. Robotic Radical Prostatectomy: Guided Training

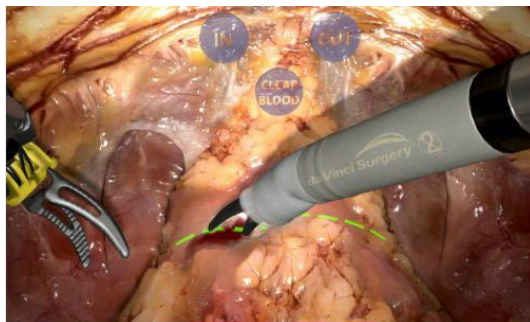
Bladder Neck Dissection: Anatomy Identification



Objectives:

- To perform inspection of the operative field and demonstrate knowledge of the surgical environment and anatomy.
- To identify the key structures involved with the Bladder Neck Dissection step.

Guided Bladder Neck Dissection



Objectives:

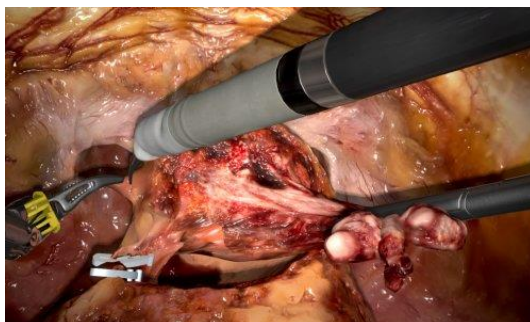
- To identify the bladder neck junction and completely separate the bladder neck from the base of the prostate.
- To identify the first part of the urethra and divide the urethra to achieve preservation of the bladder neck.

Nerve Sparing: Anatomy Identification



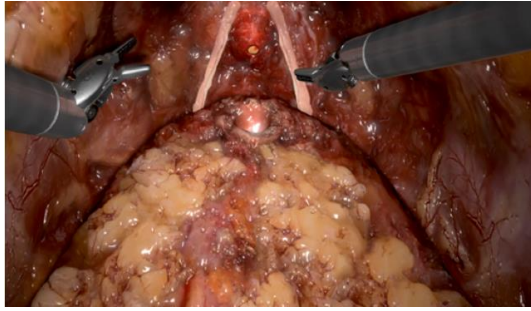
- To perform inspection of the operative field and demonstrate knowledge of the surgical environment and anatomy.
- To identify the key structures involved with the Division of Pedicles and Neurovascular Bundle step.

Guided Nerve Sparing



- To primary control the prostatic vascular pedicles.
- To release the neurovascular bundles posteriorly and along the lateral border of the prostate to the apex.

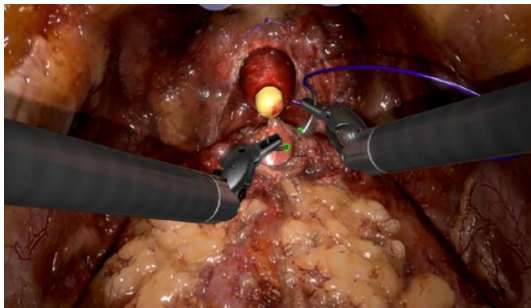
Urethrov vesical Anastomosis: Anatomy Identification



Objectives:

- To perform inspection of the operative field and demonstrate knowledge of the surgical environment and anatomy.
- To identify the key structures involved with the Urethrov vesical Anastomosis step.

Guided Urethrov vesical Anastomosis

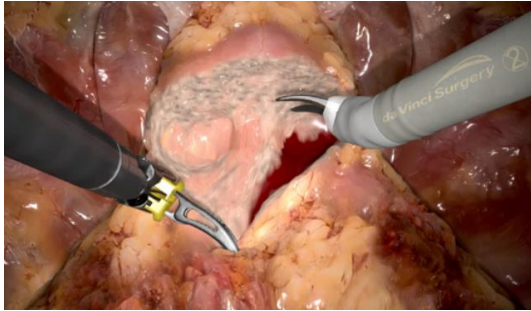


Objectives:

- To practice needle holding and manipulation associated with using wristed instrumentation.
- To perform continuous (running) suturing using two barbed sutures for the urethrov vesical anastomosis with atraumatic tissue and suture handling.

4. Robotic Radical Prostatectomy: Freehand Training

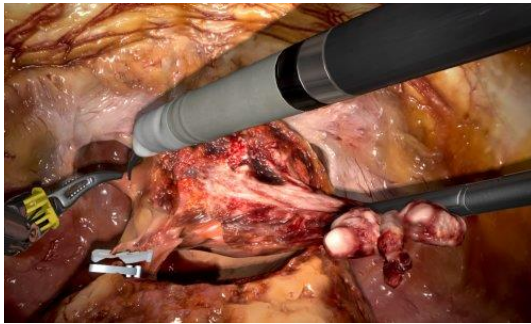
Freehand Bladder Neck Dissection



Objectives:

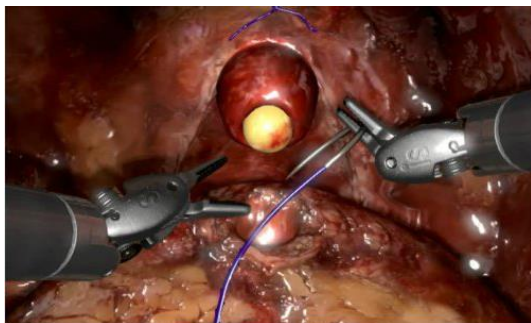
- To identify the bladder neck junction and completely separate the bladder neck from the base of the prostate.
- To identify the first part of the urethra and divide the urethra to achieve preservation of the bladder neck.

Freehand Nerve Sparing



- To primary control the prostatic vascular pedicles.
- To release the neurovascular bundles posteriorly and along the lateral border of the prostate to the apex.

Freehand Urethrovesical Anastomosis

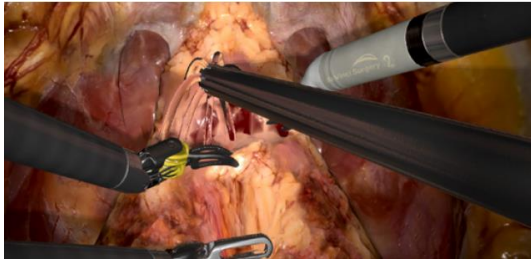


Objectives:

- To practice needle holding and manipulation associated with using wristed instrumentation.
- To perform continuous (running) suturing using two barbed sutures for the urethrovesical anastomosis with atraumatic tissue and suture handling.

5. Robotic Radical Prostatectomy: Guided Team Training

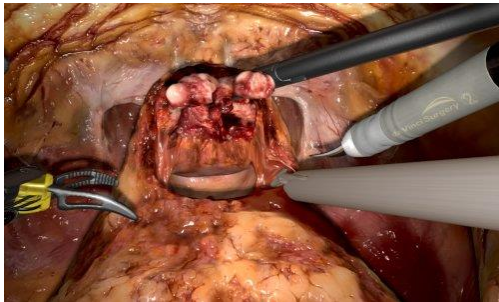
Guided Team Training: Bladder Neck Dissection



Objectives:

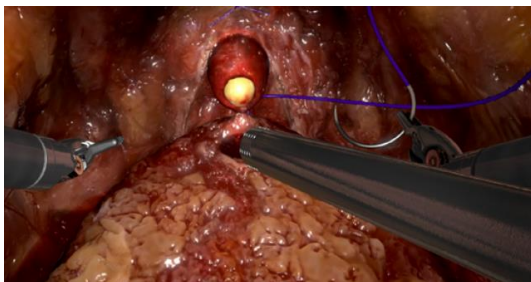
- To identify the bladder neck junction and completely separate the bladder neck from the base of the prostate.
- To identify the first part of the urethra and divide the urethra to achieve preservation of the bladder neck.
- To practice the laparoscopic assistant's roles – creating tension by pulling the catheter and clearing bleeding by using suction/irrigation.

Guided Team Training: Nerve Sparing



- To primary control the prostatic vascular pedicles.
- To release the neurovascular bundles posteriorly and along the lateral border of the prostate to the apex.
- To practice the laparoscopic assistant's role – retraction and clip applying.
- To show effective communication between the robotic surgeon and the surgical assistant.

Guided Team Training: Urethrovesical Anastomosis



Objectives:

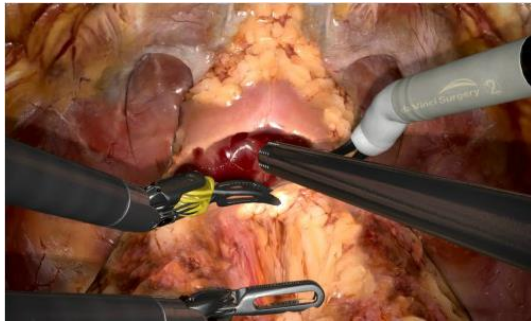
- To practice needle holding and manipulation associated with using wristed instrumentation.
- To perform continuous (running) suturing using two barbed sutures for the urethrovesical anastomosis with

atraumatic tissue and suture handling.

- To practice the surgical assistant's role: clearing bleeding by using suction/irrigation.
- To show effective communication between the robotic surgeon and the surgical assistant.

6. Robotic Radical Prostatectomy: Freehand Team Training

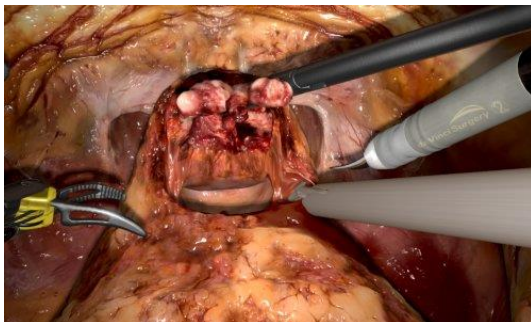
Freehand Team Training: Bladder Neck Dissection



Objectives:

- To practice needle holding and manipulation associated with using wristed instrumentation.
- To perform continuous (running) suturing using two barbed sutures for the urethrovesical anastomosis with atraumatic tissue and suture handling.
- To practice the surgical assistant's role: clearing bleeding by using suction/irrigation.
- To show effective communication between the robotic surgeon and the surgical assistant.

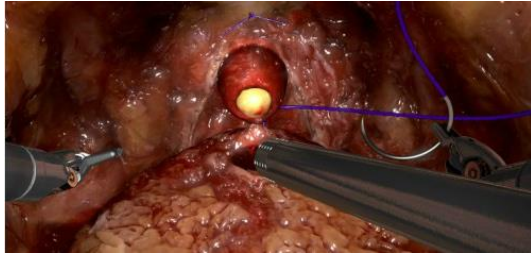
Freehand Team Training: Nerve Sparing



- To primary control the prostatic vascular pedicles.
- To release the neurovascular bundles posteriorly and along the lateral border of the prostate to the apex.
- To practice the laparoscopic assistant's role – retraction and clip applying.
- To show effective communication

between the robotic surgeon and the surgical assistant.

Freehand Team Training: Urethrovesical Anastomosis



Objectives:

- To practice needle holding and manipulation associated with using wristed instrumentation.
- To perform continuous (running) suturing using two barbed sutures for the urethrovesical anastomosis with atraumatic tissue and suture handling.
- To practice the surgical assistant's role - clearing bleeding using suction/irrigation.
- To show effective communication between the robotic surgeon and the surgical assistant.