HOW I DO IT

*Hydrodissection for preservation of neurovascular bundle during robot-assisted radical prostatectomy**

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Introduction: *To describe a technique that may facilitate neurovascular bundle preservation during robot-assisted radical prostatectomy.*

Materials and methods: *From December 2007 to January 2008, 10 patients underwent robot-assisted radical prostatectomy with bilateral nerve preservation. Hydrodissection of the neurovascular bundle was performed by injecting a 1:10000 epinephrine solution diluted in 0.9% normal saline into the lateral prostatic pedicle with an injection cannula needle (Wolf®). Operative time, blood loss and margin status were assessed when this new technique was utilized. Erectile function status will be analyzed in the future.*

Results: *Ten potent patients underwent bilateral nerve-sparing robot-assisted radical prostatectomy with hydrodissection. Mean patient age was 54 years old. Mean preoperative Gleason score was 6.5 and mean pretreatment PSA was 7.0. Six patients were clinical stage T1c and four patients were T2a. The mean operative time was 182 minutes, with a range of 148 minutes to 230 minutes. Mean blood loss was 297 cc. Hemodynamic changes were not seen during hydrodissection or after hydrodissection. No intraoperative or postoperative complications developed. None of the ten patients developed delayed postoperative bleeding. Final pathologic stage was pT2 in eight patients, pT3 in one patient and pT4 in one patient. All surgical margins were negative, except in the patient with bladder neck invasion.*

Conclusions: *We describe an athermal technique which may facilitate neurovascular bundle preservation. While intraoperative parameters were favorable with hydrodissection, long term sexual function results need to be analyzed.*

Key Words: robot, prostatectomy, technique, nerve preservation, sexual function, neurovascular bundle, hydrodissection

Introduction

Robot-assisted radical prostatectomy is increasingly being performed across the globe, especially in the United States.[1] Unlike most cancer operations where the sole goal is to achieve a negative surgical margin, urologists performing radical prostatectomy must balance between achieving cancer control (negative surgical margins) with preservation of the neurovascular bundles in appropriate patients.

In a study of 278 whole mount prostatectomy specimens, the closest distance between tumor and margin resection ranged from 0.02 mm to 5.0 mm with a mean distance of 0.7 mm.[2] The pedicle at the posterolateral aspect of the prostate is a complex intersection of delicate neurovascular structures with

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*The technique is presented in a video clip available online at www.canjurol.com

the vascular supply entering the prostate. The robotic platform with its 3D vision, wristed instruments and 10X magnification has provided an advance over standard laparoscopic surgery.

Several techniques have been described for preservation of the neurovascular bundles, however, the ideal technique has not been universally agreed upon.[3-5] Gargollo et al described hydrodissection of the neurovascular bundle during laparoscopic radical prostatectomy.[6] We present our approach to aid in the athermal dissection of the neurovascular bundles during robot-assisted radical prostatectomy.

Materials and methods

Hydrodissection was performed in 10 potent men who underwent bilateral nerve sparing robot-assisted radical prostatectomy. A retrospective review of our prostate cancer database was performed to assess operating room times, blood loss, intraoperative complications, hemodynamic changes, postoperative bleeding and final margin status when performing hydrodissection during robot-assisted radical prostatectomy. Erectile function will be assessed at 6 months and 1 year.

Technique

After division of the bladder neck and athermal dissection of the vas and seminal vesicles using small Weck® clips, the plane between the prostate and the rectum is developed. The rectum is dropped from the prostate and dissection of neurovascular bundles is performed.

We use an injection cannula needle (Wolf®) to inject the solution into the prostatic pedicle in order to elevate and hydrodissect the neurovascular bundle away from the prostate, Figures 1 and 2. The console surgeon should visualize the injection cannula needle entering via the right assistant port to avoid inadvertent injury to surrounding structures. The tip of the injection cannula needle is used to infiltrate each lateral pedicle with a solution of approximately 10 ml of epinephrine (1:10000) diluted with 100 ml of injectable (0.9 %) normal saline. If the injection cannula needle was not available, we have also successfully used intravenous tubing with a 1 inch, 27-gauge needle. Epinephrine is added to the solution in order to minimize bleeding from small vessels and, thereby, improve visualization of the anatomic planes.

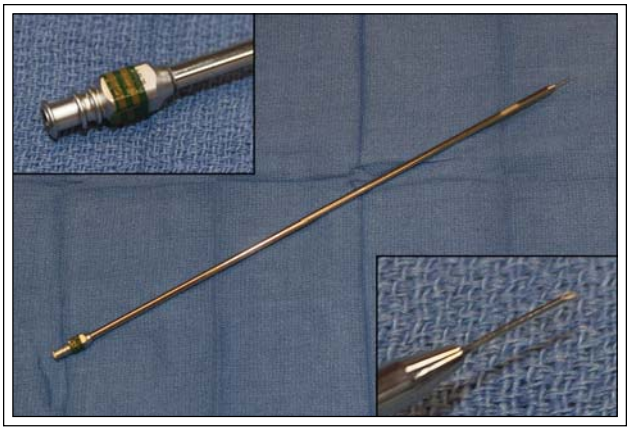

Figure 1. Injection cannula needle (Wolf®).

After injection, a wheal is typically noticed in patients with thinner lateral pedicles, but may not be seen in all patients. Injection results in expansion of the space between the prostate capsule and the neurovascular bundle, creating a fluid curtain around the vessels in the pedicle. Hydrostatic pressures generated from hydrodissection push the neurovascular bundle away from the prostate capsule along natural tissue planes. A grasper is used to gently spread in the space between the prostatic capsule and the neurovascular bundle along the vessels, without using cautery. This maneuver helps identify individual vessels entering into the prostate, which are clipped with 5 mm hemo-lock clips. Once the pedicle is released at the base of the prostate, further dissection is performed by simply pushing the tissue away from the posterolateral surface of the prostate. Care must be taken by the surgeon to monitor for inadvertent entry into the prostate capsule when performing blunt dissection.

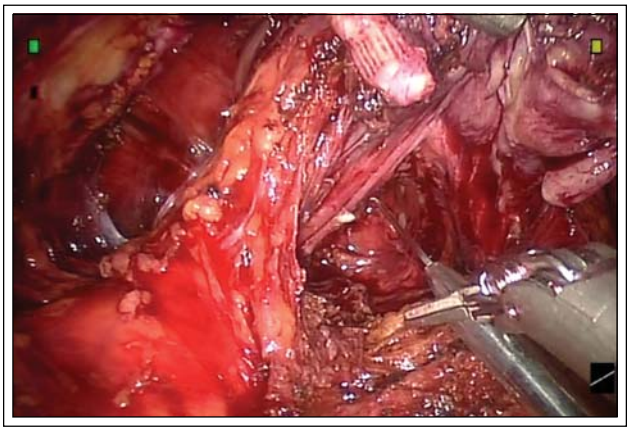

Figure 2. View of the vascular pedicle before the insertion of injection cannula needle.

A caveat to this procedure is to insert the injection needle in the lateral prostatic pedicle a few millimeters away from the base of the prostate. The goal is to dissect the neurovascular bundle away from the base of the prostate, while avoiding insertion of the needle into the neurovascular bundle. Once the neurovascular bundle is separated from the prostate, the surgeon can visualize the insertion of individual vessels from the pedicle into the prostate. Insertion of the injection cannula needle too close to the base of the prostate could distort the anatomy and increase the likelihood of positive surgical margins.

Results

Ten patients underwent hydrodissection during bilateral nerve-spare robot-assisted radical prostatectomy. The mean patient age was 54 years with a mean preoperative prostate specific antigen of 7 ng/ml. The clinical stage was T1c in six and T2a in four. Average sexual function based on the UCLA prostate cancer index (UCLA-PCI-SF) was 4, Table 1.

Total operative time was 182 minutes (148-230) with an estimated blood loss of 297 ml (50-550). All patients underwent bilateral simple hydrodissection without difficulty. Intraoperative complications, hemodynamic changes and delayed postoperative bleeding did not occur in this patient cohort. Final pathologic stage was pT2 in 8, pT3 in 1 and pT4 in 1. The patient with T4 disease had a positive surgical margin at the bladder neck. Postoperative erectile function will be evaluated at 6 months and 1 year.

Discussion

To preserve the neurovascular bundle, it is important to minimize the use of electrocautery, avoid traction of the bundle, dissect in the correct plane between the neurovascular bundle and the prostate, avoid capsular penetration and avoid inadvertent ligation of the neurovascular bundle. The ideal technique for maintaining hemostasis during nerve preservation should be easy to perform, adequately control bleeding and minimize collateral thermal damage.[7] Several different options have been utilized to control the vascular pedicle including monopolar caurtery, bipolar cautery, hemostatic clips, hemostatic agents and suture ligation of the lateral pedicle with or without application of bulldog clamps.[8,9] Hemostatic bioadhesives, such as Floseal (Baxter Medical, Fremont, California), have been reported to produce a localized inflammatory response, reactionary fibrosis and can be unreliable in maintaining hemostasis.[8,10] Ong et al studied the affect of different electrocautery devices including ultrasonic shears, monopolar and bipolar electrocautery in a canine study and discovered that utilization of hemostatic energy sources during neurovascular dissection was associated with significant decrease in erectile response to cavernous nerve stimulation.[11] Khan et al[12] studied a porcine model and found that the prostate pedicles worked as heat sinks to protect the neurovascular bundles from thermal injury during bladder neck transection with electrocautery. The same study suggested that use of electrocautery to control the vascular pedicles can generate extensive thermal energy across the neurovascular pedicles, leading to potential injury.

TABLE 1. **Demographics**

Patient	Age	PSA	Gleason	Stage	Erectile function (EF)
1	56	4.7	3 + 3 = 6	T1c	5
2	50	5.6	3 + 4 = 7	T2c	2
3	58	4.3	3 + 4 = 7	T2a	4
4	52	4.6	3 + 4 = 7	T2a	5
5	58	8.3	3 + 3 = 6	T1c	5
6	58	13.4	3 + 3 = 6	T1c	3
7	49	2.6	3 + 3 = 6	T1c	5
8	49	5.0	3 + 3 = 6	T1c	4
9	57	13.3	4 + 3 = 7	T2b	2
10	53	6.3	4 + 3 = 7	T1c	2

In 1987, Toth et al[13] pioneered the use of gentle hydrodissection to separate tumor from normal brain parenchyma and hydrodissection has been used in several subspecialties including neurosurgery, general surgery and plastic surgery with success. May and McGovern[14] attempted a similar technique during open radical retropubic prostatectomy. Gargollo et al described hydrodissection of the neurovascular bundles during laparoscopic radical prostatectomy.[6] Advantages of hydrodissection include reduction in tissue damage, limited manipulation of tissue and visualization of the correct tissue planes. Minimal trauma with hydrodissection has been demonstrated by several studies.[15,16]

Shekarriz pioneered Hydro-Jet (Erbe, USA) dissection during retroperitoneal lymph node dissection utilizing hydrostatic pressures up to 300 psi to separate nodal packets away from the great vessels and sympathetic nerves.[17] Manual hydrodissection differs from hydro-jet dissection by dissecting tissue planes at much lower pressures. We believe manual hydrodissection dissects along normal anatomic tissue planes at low pressures and has a lower potential for tissue injury than devices that hydrodissect at higher pressures. High pressure devices may injure tissue and distort normal anatomic tissue planes. Our attempt at Hydro-Jet dissection failed as the irrigation frequently contaminated the camera lens, making visualization suboptimal.

Conclusions

Our intent in this brief communication is to describe a technique, which in our hands, facilitates the dissection of the neurovascular bundle during robot-assisted radical prostatectomy. Long term follow-up will be needed to assess potency in these patients and prospective randomized studies would be required to demonstrate comparisons of outcome with conventional techniques. □

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