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Nörovasküler Bundle Koruyucu Robot Yardımlı Radikal Prostatektomide Klipsiz ve Atermal Pedikül Kontrolü Sağlayan Selektif Sütürasyon Tekniği

Clipless and Atermal Pedicle Control with Selective Suturing Technique Proceeding with Neurovascular Bundle Preservation during Robot Assisted Radical Prostatectomy

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ÖZET

Amaç: Robot yardımlı radikal prostatektomi operasyonu sırasında pedikül kontrolü; cerrahi klipler ve/veya farklı enerji kaynakları kullanılarak yapılabilmektedir. Cerrahi kliplerin migrasyonu; mesane boynu kontraktürüne ve mesane taşı oluşumuna sebep olabilmektedir. Diğer taraftan; pedikülün ayrılması sırasında kullanılan farklı enerji kaynakları, potensin düzelmesinde kritik role sahip sinirlerde termal hasara yol açabilmektedir. Bu durumun önüne geçebilmek için; nörovasküler bundle koruyucu robot yardımlı radikal prostatektomide; klipsiz ve atermal pedikül kontrolü sağlayan selektif bir sütürasyon tekniği tanımladık.

Gereç ve Yöntemler: Robot yardımlı radikal prostatektomi(RYRP) transperitoneal olarak antergrad şekilde gerçekleştirildi. Mesane boynu insizyonunu takiben; prostat pedikülü ayrıldı. Öncelikle prostatın sağ pedikülü serbestlendi ve kesildi. Kanama kontinü şekilde atılan V-Loc dikişlerle kontrol edildi. Nörovasküler bundle, prostat kapsülünden basis bölümünde başlanıp apekse doğru ilerleyecek şekildi nazikçe ayrıldı. Aynı işlem prostatın sol pedikülü için de gerçekleştirildi. Prostatektomi aşamasını takiben, yüzeyel kanamalar titiz bir şekilde , separe 5-0 polifilaman dikişlerle kontrol edildi. Bu teknik; Mart 2018 ve Mayıs 2019 tarihleri arasında 29 hastada uygulandı. Bilateral sinir koruyucu yaklaşım tüm vakalarda gerçekleştirildi.

Bulgular: Ortalama pre-operatif PSA 8,1±2,1 ng/ml, ortalama hasta yaşı 60,8±6,5 , ortalama takip süresi ise 13,6±9,9 aydı. Ortalama konsol zamanı, intraoperatif kan kaybı ve prostatektomi spesimen ağırlığı sırasıyla 201±45 dakika, 237±97 ml. and 59±29 gr. olarak hesaplandı. Komplikasyonlar Clavien-Dindo sınıflamasına gore değerlendirildi. Clavien Derece 2, 3a and 3b komplikasyonlara sırasıyla 1,2 ve 1 hastada karşılaşıldı. Cerrahi sınırlar pozitifliği 5 hastada saptandı(%17,2). Post-operatif birinci ayda 29 hastanın 28'i kontinandı. PDE5 inhibitörü ile potens oranı ise %66'ydı.

Sonuç: RYRP(Robot yardımlı radikal prostatektomi)'de klipsiz pedikül kontrolü; intraoperatif kan kaybını etkilemeksizin uygulanabilir bir yöntem olarak gözükmektedir.

Anahtar Kelimeler: *prostat kanseri, robotik cerrahi, klipsiz*

ABSTRACT

Aim: During robot assisted radical prostatectomy, pedicle control can be accomplished by surgical clips and/or using different energy sources. Migration of surgical clips can cause bladder neck contracture and bladder stone forma-tion. On the other hand; using different energy sources during pedicle division may cause thermal injury of the nerves

This study was studied retrospectively. All research was performed in accordance with relevant guidelines/regulations, and informed consent was obtained from all participants.

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which are critical for recovery of potency. In order to obviate this situation; we describe clipless and athermal pedicle control with selective suturing technique proceeding with neurovascular bundle preservation during robot assisted radical prostatectomy.

Matherial and Methods: Robot assisted radical prostatectomy (RARP) is performed via transperitoneal route in antegrade fashion. After bladder neck incision, prostatic pedicle is divided. First right prostatic pedicle is selectively freed and cut. Bleeding is controlled by a running V-Loc suture. Then neurovascular bundle is gently separated from the prostatic capsule starting at the basis and proceeding towards the apex. The same procedure is performed for the left prostatic pedicle. Following prostatectomy superficial bleeders are meticulously controlled by separate 5-0 polyfilament sutures. Between March 2018 and May 2019 this technique was performed in 29 patients. Bilateral nerve sparing procedure was carried out in all cases.

Results: Mean preoperative PSA was 8.1±2.1 ng/ml, mean patient age was 60.8±6.5 and mean follow-up was 13.6 ±9.9 months. Mean console time, intraoperative blood loss and prostatectomy specimen weight were 201±45 min, 237±97 ml. and 59±29 gr., respectively. Complications were assessed according to the Clavien-Dindo classification. Clavien Grade 2, 3a and 3b complications were encountered in 1, 2 and 1 patients, respectively. Surgical margins were positive in 5 patients (17.2%). At post-operative first month 28 of 29 patients were continent. Potency rate was 66% with PDE5 inhibitors.

Conclusion: Clipless control of pedicles during RA RP(Robot assisted radical prostatectomy) seems to be feasible without compromising intraoperative blood loss.

Keywords: *Robotic surgery, prostate cancer, clipless*

INTRODUCTION

Neurovascular bundle is closely related to the posterolateral aspect of the prostate between the true capsule and lateral prostatic fascia (1). Therefore, any energy application (monopolar, bipolar, ultrasonic scissors) at this delicate area for hemostatic purpose can be responsible for decreased erectile response to cavernous nerve stimulation. Using surgical clips in radical prostatectomy (open, laparoscopic, robotic) is accused for several complications including migration, bladder neck contraction and bladder stone formation (2-7). Dissection with suture ligatures does not affect the erectile response to nerve stimulation (8). In this study; we present our experience with a clipless and athermal pedicle control with selective suturing technique proceeding with neurovascular bundle preservation during robot assisted radical prostatectomy.

MATERIAL AND METHODS

Robot assisted radical prostatectomy is performed by da Vinci system with six port configuration via transperitoneal approach as described by Menon et al (9). Retzius space is reached after the peritoneal incision. Bladder neck is divided by monopolar scissors. First right seminal vesicle is freed and vas deferens is cut by monopolar scissors. Hem-o-Lok clip for hemostatic purpose is only used at the tip of the seminal vesicles if necessary. The same procedure is performed for the left side. Bilateral dissected seminal vesicles and vas deferences are retracted anteriorly. Once Denonvillier's fascia is incised, access to the prerectal space along the posterior surface of the prostate is developed. First, right prostate vascular pedicle is attenuated by blunt dissection. These thinned pedicle attachments are cut without using any Hem-o-Lok clips or energy (bipolar, monopolar, harmonic etc.) in efforts to control bleeding. After division of the prostatic pedicles, prostatic fascia incision is carried out in order to develop the neurovascular bundle-sparing plane. Hemostasis following division of the prostatic pedicles is maintained by 3/0 V-Loc barbed suture in running fashion. (Image 1, Image 2) Peeling of the periprostatic fascia, prostatic pedicle and neurovascular bundle is carried out along the posterolateral surface of the prostate. Delicate handling of the prostatic pedicle is of paramount importance to minimize the traumatic effect. (Image 3) Intermittent saline irrigation is used for both gaining a clear vision and improving the dissection plane.

When apical and urethral dissection is completed, same steps are performed on the left side. (Image 4) Small venous bleedings are left without any intervention relying on intraabdominal pressure, but arterial bleedings are controlled by separate 5-0 absorbable polyfilament sutures. (Image 5). Neurovascular bundles are preserved bilaterally (Image 6). We started to implement this clipless and athermal pedicle control with selective suturing technique proceeding with neurovascular bundle preservation after performing 1450 cases. Until now; this technique with bilateral nerve sparing procedure was applied in 29 patients.

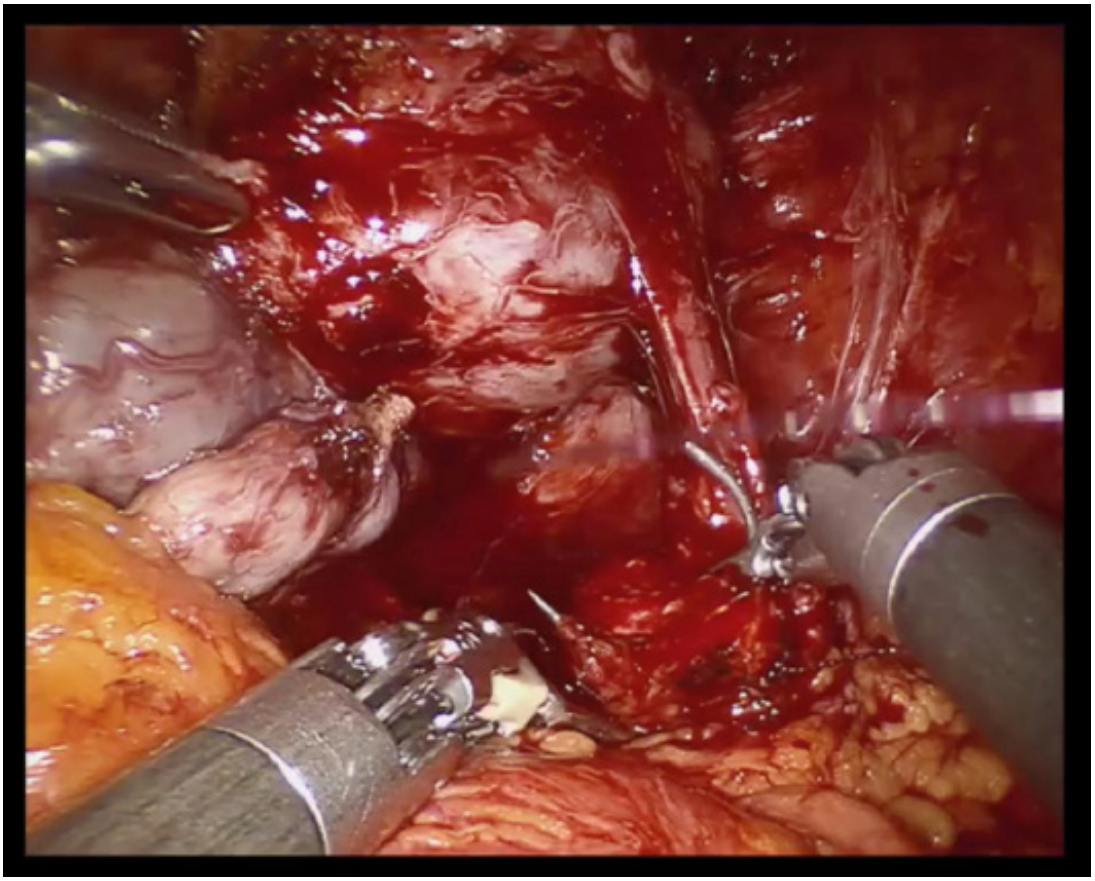

Image 1: Control of the right prostatic pedicle by 3/0 V-Loc barbed suture

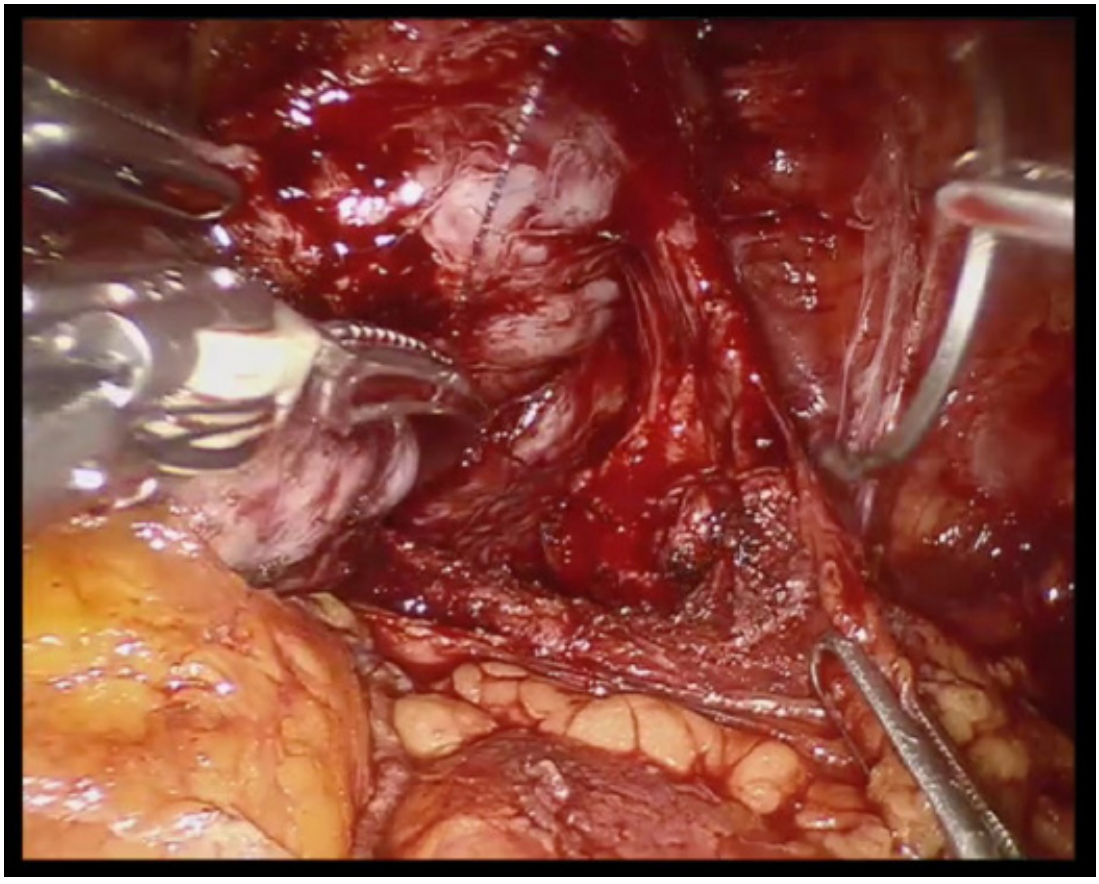

Image 2: Hemostasis at the prostatic pedicle is maintained by suturing in running fashion

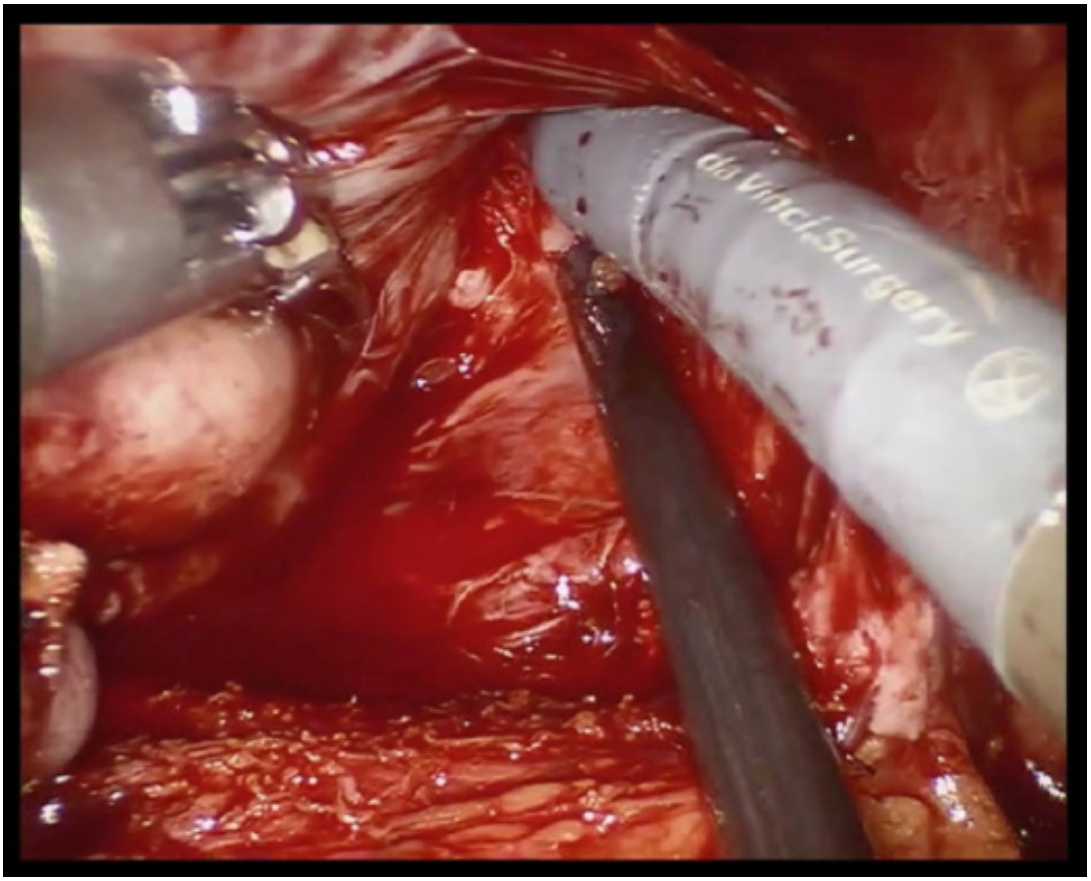

Image 3: Delicate handling of the prostatic pedicle

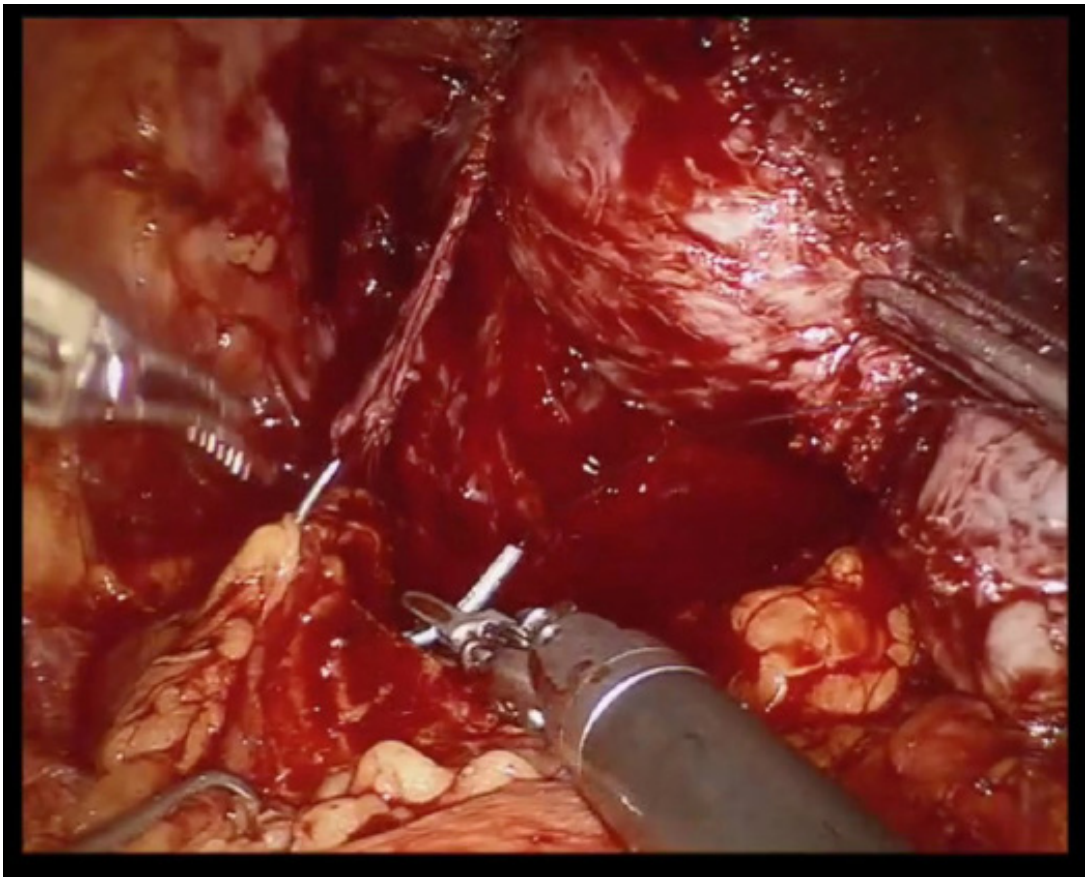

Image 4: Same steps are performed for the left prostatic pedicle

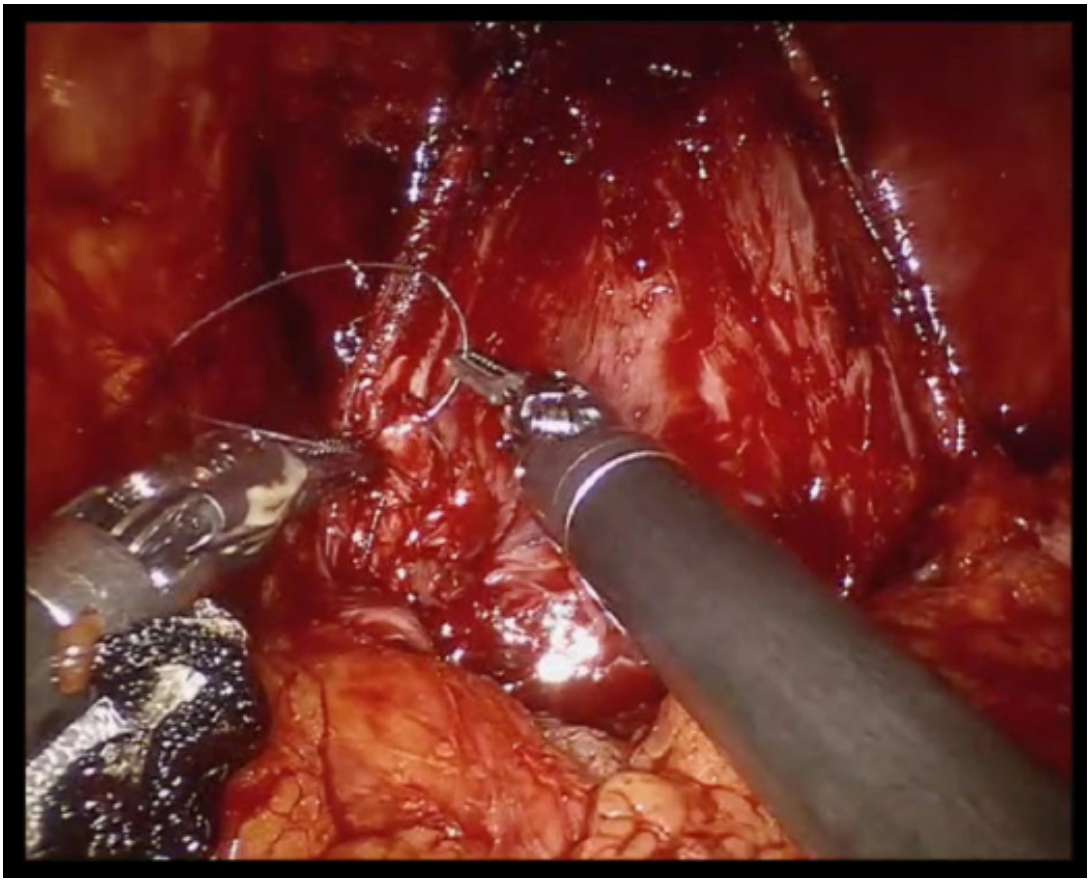

Image 5: Control of the small arterial bleedings by seperate 5-0 absorbable polyfilament sutures

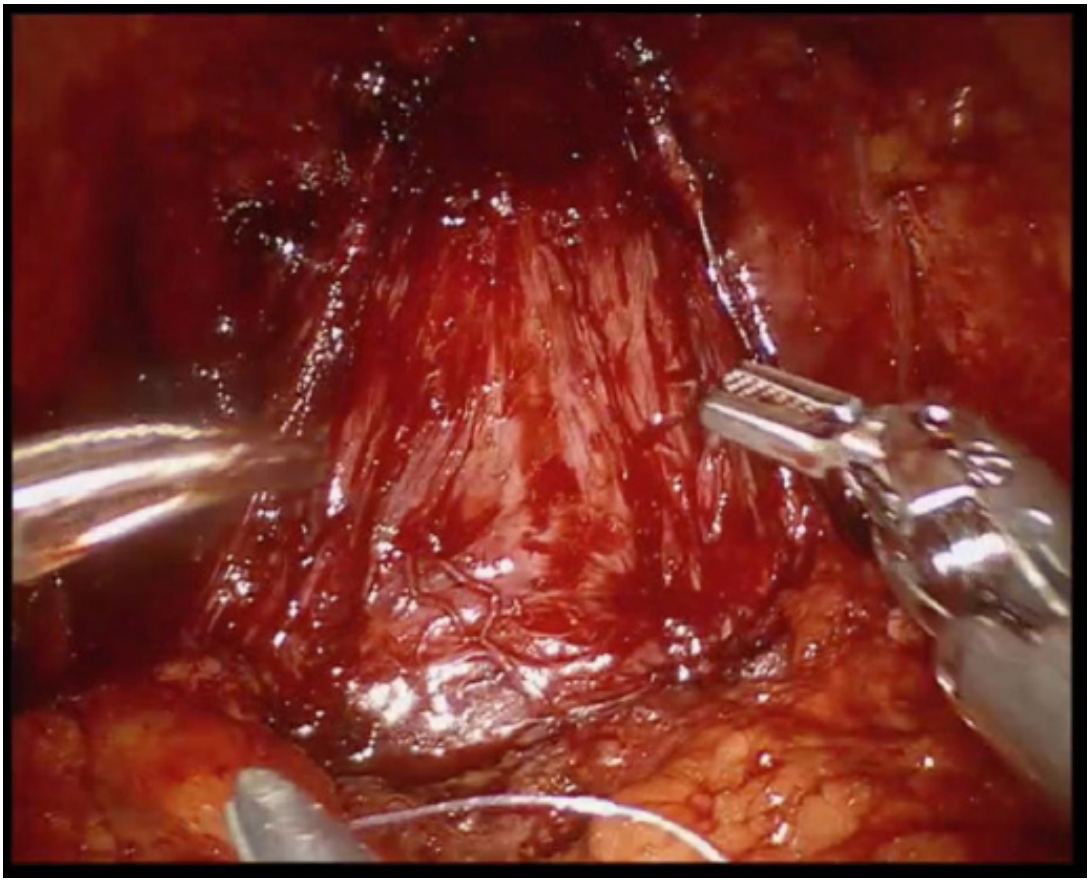

Image 6: Neurovascular bundles after removal of the prostate

RESULTS

Between March 2018 and May 2019 this technique was performed in 29 patients. Bilateral nerve sparing procedure was carried out in all cases. Mean pre-operative PSA was 8.1±2. 1-ng/ml, mean patient age was 60.8±6.5 and mean follow-up was 13.6±9.9 months. Mean intraoperative blood loss, console time and prostatectomy specimen weight were 237±97 ml., 201±45 min. and 59±29 gr, respectively. Complications were assessed according to the Clavien- Dindo classification. Clavien Grade 2, 3a and 3b complications were encountered in 1, 2 and 1 patient, respectively. Bilateral ureteral single J catheter replacement under general anesthesia was performed in 1 patient because of anastomotic leakage (Clavien 3b). After 3 weeks, both catheters were removed and the patient urinated uneventfully. Recatheterization was required in 2 patients, 1 due to anastomotic leakage at postoperative day 10 and 1 due to hematuria at postoperative day 30 (Clavien 3a). Both patients had the indwelling Foley catheters for another 5 days and after catheter removal none of these patients encountered any urologic problems. Pulmonary embolism occurred in 1 patient at post-operative day 30 (Clavien 2). This patient was treated with low molecular weight heparin without any further problem. Final pathology revealed pT2N0 disease in 18 patients, pT3aN0 in 9 patients, and pT3bN0 in 2 patients. Surgical margins were positive in 5 patients (17.2%). Gleason pattern at the positive surgical margin was 4 in 4 patients and 3 in 1 patient. At post-operative first month 28 of 29 patients were continent. Erectile function was evaluated at post-operative third month. Eighteen of 29 patients were concerned about sexual activity, while remaining 11 were not and did not want to report on this subject. At postoperative third month, 12 of these 18 patients are potent (66%) with PDE5 inhibitors. Remaining 6 patients were not able to have sexual intercourse with PDE5 inhibitors. One of these 6 patients can have sexual intercourse with intracavernous injection. The other 5 patients refused to use intracavernous injections.

Discussion

Neurovascular bundle preservation is one of the most critical steps in robot-assisted radical prostatectomy. We believe that our modified clipless and cautery free technique can establish superiority over traditional method regarding post-operative clip related complications and thermal injury of the neurovascular bundle. Surgical clips used in radical prostatectomy may rarely migrate. Clip migration can cause bladder stone formation and bladder neck contracture (1-6). Mechanism of this complication is poorly understood. Surgical clips in proximity to the vesicourethral anastomosis or bladder can erode the bladder wall and migrate due to the local inflammation (10). These migrated clips can trigger a foreign body reaction and act as a nidus which eventually originates bladder stone. Yi et al. reported bladder stone formation around the metal clips in 2 of 439 open radical prostatectomies (11). Banks et al. reported a case of bladder stone formation resulting from Weck clip migration after laparoscopic radical prostatectomy (12). Another case of intravesical migration and spontaneous expulsion with stone formation around a Hem-o-Lok clip after laparoscopic radical prostatectomy was reported by Mora et al. (13). Kadekawa et al. also reported a case of bladder stone formation around a metal clip which was presented with dysuria and macroscopic hematuria three years after radical retropubic prostatectomy.

Another surgical complication related to the surgical clips is formation of bladder neck contracture. Mechanism of this unpleasant complication is also poorly understood. Researchers hypothesized that microvascular disease caused by local ischemia in the vesicourethral anastomosis may lead to poor anastomotic healing and scar formation (14). Blumental et al. reported 2 (0.4 %) cases of bladder neck contracture following Hem-o-Lok clip migration in their series of 524 robot assisted radical prostatectomies. One of these patients was treated by removal of the clip and KTP laser vaporization of the stricture. The second patient was treated with clip removal, transurethral incision of the bladder neck scar and steroid injection (15). Similarly, Yi et al. reported Hem-o-Lok clip related bladder neck contracture in 2 of the 153 patients in their robot assisted radical prostatectomy series. Both patients were treated with clip removal and single urethral dilatation. No recurrences were encountered and none of the patients required self-catheterization on follow-up (11). More recently; Cormio et al. reported a 62 years old patient with bladder neck contracture caused by Hem-o-Lok clip migration. This patient presented with acute urinary retention that required suprapubic drainage 3 months after robot assisted radical prostatectomy. Urethroscopy showed severe bladder neck contracture and a Hem-o-Lok clip adhered to the area between the vesicourethral anastomosis and the urethral sphincter. This patient was treated with wide resection of the bladder neck contracture after cold-knife urethral incision and removal of the clip. At 1-year follow-up, the patient did not require self-catheterization and experience recurrence, but developed urinary incontinence probably due to the accidental injury to the sphincteric function caused by wide resection (16).

In case of thick tissue bundles or inappropriate clip placement; troublesome hemorrhages may persist. Therefore; laparoscopic and robotic surgeons mostly use some form of energy to achieve proper hemostasis. Electrocautery (bipolar, monoplar, harmonic) causes primarily thermal injury to the neuronal tissue. In a canine model; Ong et al. demonstrated the detrimental effect of thermal energy to the cavernous nerve during neurovascular bundle dissection. They compared monopolar, bipolar and harmonic energy with conventional suture ligatures (without energy). They measured peak intracavernous pressures acutely and 2 weeks after the neurovascular bundle dissection. The group; in which energy (monopolar, bipolar, harmonic) had been used; showed significant reduction in intracavernous pressure; both acutely (74% to 91% reduction compared to control group) and 2 weeks after (93% to 96% reduction compared to control group) the dissection. In contrast, they found that using conventional techniques during dissection (suture ligatures) does not affect the erectile response (8). Ahlering et al. reported the potency outcomes at postoperative third month with a cautery-free neurovascular bundle dissection technique during robot-assisted radical prostatectomy. In this study; they compared the potency outcomes of the patients whose neurovascular bundle dissections were performed by cautery-free technique (23 patients) with the patients in whom bipolar cautery was used traditionally (36 patients). In cautery-free group, a bulldog clamp was placed to control the prostatic vascular pedicle after seminal vesicle dissection and mobilization of the rectum. After completion of neurovascular bundle mobilization and prostatectomy; bulldog clamps were removed from the both pedicles. Any pulsatile arterial bleeding in this area was controlled by 3-0 figure-of-eight sutures. Reported potency rate was 43% (10 patients) in the cautery-free group and 8.3% (3 patients) in the bipolar-cautery group at 3 months. This study concluded that neurovascular bundle dissection without cautery is crucial for early return of erectile function (17). Another technique of lateral vascular pedicle control during laparoscopic radical prostatectomy which obviates the use of energy, clips or bioadhesives was reported by Gill et al. This technique includes temporary control of the lateral vascular pedicle of the prostate by bulldog clamp and was performed in 25 patients. Superficial hemostatic control of the transected lateral pedicle close to the bladder neck was maintained by 4-0 Vicryl. Any additional bleeding that was noticed after the bulldog clamp removal was sutured meticulously. In this study; the arterial flow within the neurovascular bundle was recorded by real-time transrectal ultrasonography before, during and after the pedicle clamping. The mean resistive index of arterial flow within the neurovascular bundle was found to be not affected before clamping, during clamping and after clamp removal (0.86, 0.85 and 0.85, respectively) (18).

CONCLUSION

This clipless and athermal pedicle control with selective suturing technique proceeding with neurovascular bundle preservation seems to be feasible and safe. Although we did not report the long-term post-operative follow-up data on functional outcomes early results are promising. Long-term randomized controlled studies are necessary to evaluate the efficacy of this technique with regard to blood loss, potency and continence. However, it is certain that this technique will prevent post-operative clip related complications.

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