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ORIGINAL PAPER

Comparison of the urethrovesical anastomoses with polyglecaprone (Monocryl®) and bidirectional barbed (V-Loc 180®) running sutures in laparoscopic radical prostatectomy

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Summary *Objective: We compared polyglecaprone (Monocryl®) and bidirectional barbed (V-Loc® 180) running sutures during urethrovesial anastomosis (UVA) in laparoscopic radical prostatectomy (LRP).*
Materials and methods: A total of 92 consecutive patients underwent extraperitoneal LRP for prostate cancer. In the first 47 patients, the running UVA was performed using 3-0 monofilament polyglecaprone (Monocryl®) suture (Group 1). In the subsequent 45 patients, the running UVA was performed with the 3-0 barbed suture (V-Loc® 180) (Group 2). Rhabdosphincter reconstruction was performed in all the patients.
Results: The mean prostatectomy time was 196 and 179 minutes in Group 1 and 2, respectively ($p < 0.001$). Moreover, the mean UVA time was 40 and 24 minutes in Group 1 and 2, respectively ($p < 0.001$). Also, catheterization time, lenght of hospital stay and the number of the patients with urine leakage were significantly lower in Group 2 than the other ($p < 0.001$). No patients in V-Loc® 180 suture group and 5 patients in Monocryl® suture group experienced postoperative drain leakage in the present study. Overall pad usage at 6th month was higher in group 1 than the other group. In group 1 and 2, 78.7% and 93.3% of the patients reported 0 to 1 pads daily, whereas 21.3% and 6.7% reported ≥ 2 pads daily ($p = 0.002$).
Conclusions: We therefore consider that use of barbed suture running UVA during LRP is associated with a significantly shorter operative time maintaining a proper suturing tension compared with standard suture and it is not associated with a higher incidence of adverse events with no postoperative complications.

KEY WORDS: *Radical prostatectomy; Laparoscopy; Barbed suture; Anastomosis.*

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INTRODUCTION

The first Laparoscopic Radical Prostatectomy (LRP) series were published by Schuessler and co-workers in 1997 (1). After that, LRP was developed to paralel the success achieved with the open approach, while offering the advantages of minimally invasive surgery (2). Intracorporeal suturing is considered to the most challenging and difficult procedure in laparoscopic surgery. The urethrovesical anastomosis (UVA) is definitely one of the critical and time consuming step of the LRP and requires an experienced surgeon with advanced laparoscopic skills (3, 4). Moreover, suturing and knot tying can be often be challenging in the confines of true pelvis, which requires cautious handling of the suture and tissues.5 To facilitate the UVA technique, several techniques with using monofilament sutures have been advised in the international literature (5-7).
Greenberg and associates demonstrated that monofilament suture has the potential of localized tissue necrosis, reduced fibroblast proliferation, and excessive tissue overlap, all of these factors can reduce the strength of the healed wound (8). To deal with this problem, a barbed suture (*V-Loc®, Covidien Healthcare, MA, USA*) has been introduced into the surgical practice. The undirectional barbs maintain running suture line tension and purportedly obviate the need for knot tying. In the international literature, this suture has been extensively used during UVA in robot-assisted radical prostatectomy (RARP) (9-16). To our knowledge, there is no publication about barbed suture usage during UVA in LRP.
In the current study, we compared the efficacy and safety of polyglecaprone (*Monocryl®, Ethicon, NJ, USA*) and bidirectional barbed (*V-Loc 180®, Covidien Healthcare, MA, USA*) running sutures during UVA in extraperitoneal LRP.

MATERIAL AND METHODS

The Institutional Review Board approval was taken for data collection in our radical prostatectomy patients. A

No conflict of interest declared.

total of 92 consecutive patients underwent extraperitoneal LRP for prostate cancer between August 2010 to September 2012. Inclusion criteria included clinically organ confined or locally advanced prostate cancer (clinical ≤ T3a).

In the first 47 patients, the UVA was performed using 3-0 standard monofilament polyglecaprone (*Monocryl®, Ethicon, NJ, USA*) suture (Group 1). For the UVA, a bidirectional suture with 2 needles was prepared from two 15 cm sutures knotted on the distal ends and used to perform running anastomosis. In the subsequent 45 patients, the UVA was performed with the 3-0 barbed suture (*V-Loc®180, Covidien Healthcare, MA, USA*) (Group 2). For the UVA, a bidirectional barbed suture with 2 needles was prepared from two 15 cm sutures. After than 3-0 barbed sutures by passing the needle of each suture though the looped end effecter the other and the running anastomosis was performed. The UVA was performed in each group by using conventional Van Velthoven (running) method which has been previously described (6). In Group 2, standart Van Velthoven technique was performed without knot tying at the end of anastomosis. At the end of the anastomosis, we passed a Foley urethral catheter into the bladder, and we filled the bladder with 150 ml of sterile saline solution while under direct visualization. Just before completion the operation, we routinely placed a Jackson-Pratt drain to the perianastomotic region.

The rhabdosphincter re-construction is performed in all the patients as described previously with using either *Monocryl®* or *V-lock®180* barbed suture (17). All the operations were performed by one of us (M.A.). The surgeon had performed 40 LRP until beginning of the current study.

The primary outcome measured was the UVA time; starting once the anchoring suture was placed and finished when two running sutures were tied together in Group 1 and without knot tying in the other group. Secondary outcome measured included urinary leak defined as either perioperative saline leakage or postoperative increased drain output confirmed by an elevated drain fluid creatinine level. Contrast extravasation on postoperative 10th day was characterized as delayed healing; postoperative day of catheter removal was defined as lenght of urethral catheterization time. Postoperative urinary incontinence was assessed at 6th month follow-up visit by patient recorded total daily pad using.

Statistical analysis

Statistical analysis was performed with using *Statistical Packet For Social Sciences for Windows (Chicago, IL, USA)* version 13.0 software.

Descriptive statistics of the groups were calculated. The outcomes were expressed as the mean ± standard deviation.

The numerical data with normal distribution were compared with Independent sample t test, and the data without normal distribution were compared among groups with the Mann-Whitney U test. In addition, Chi-square and Fisher Exact tests were used to compare categorical variables. A p value less than 0.05 was significant.

Table 1.
Effetti clinici e impatto economico della dutasteride e finasteride su uomini italiani con LUTS.

Parameters	Group 1 (n = 47)	Group 2 (n = 45)	p value
Age (yr)	63.1 ± 6.3 (46-75)	65.2 ± 5.7 (49-76)	0.740
Preoperative PSA (ng/ml)	9.0 ± 5.9 (1.3-28.6)	11.0 ± 11.5 (3.5-68)	0.439
BMI (kg/m^2)	27.0 ± 5 (17.0-37.6)	26.9 ± 4.5 (18.3-39.7)	0.385
Biopsy Gleason score (n)			
6	31	39	0.204
7	16	5	
≥ 8	-	1	
Previous abdominal surgery (n)	15	16	0.966
Prostate volume (ml)	39.6 ± 14.0 (18-76)	40.4 ± 20.2 (14-108)	0.440

Results

Baseline patients characteristics which did not different the each group are summarized in Table 1. During the operation, the mean prostatectomy time was 196 and 179 minutes in Group 1 and 2, respectively ($p < 0.001$). Moreover, the mean UVA time was 40 and 24 minutes in

Table 2.
Intraoperative and postoperative parameters of the patients. Data presented as median ± standard deviation with minimum and maximum values in parenthesis.

Parameters	Group 1 (n = 47)	Group 2 (n = 45)	p value
Prostatectomy time (min)	196.1 ± 24.2 (160-276)	179.7 ± 20.5 (132-220)	< 0.001
UVA completion time (min)	40 ± 7.1 (24-58)	24.0 ± 5.5 (16-45)	< 0.001
Estimated blood loss (ml)	424.6 ± 172.7 (160-810)	415.1 ± 223,1 (120-900)	0.851
Postoperative leakage in cystogram (n)	5	-	0.001
Catheterization time (d)	14.0 ± 1.7 (12-21)	9.0 ± 1.9 (7-13)	< 0.001
Lenght of hospital stay (d)	4.2 ± 1.5 (2-10)	2.1 ± 0.4 (2-4)	< 0.001
Surgical Gleason score (n)			
6	21	26	0.987
7	17	18	
≥ 8	9	1	
6th month urinary continence rate			
0-1 pads daily	37(78.7%)	42 (93.3%)	0.002
≥ 2 pads daily	10 (21.3%)	3 (6.7%)	

Group 1 and 2, respectively ($p < 0.001$). Also, catheterization time, lenght of hospital stay and the number of the patients with urine leakage were significantly lower in Group 2 than the other ($p < 0.001$). All other perioperative parameters were statistically equivalent between the groups, including estimated blood loss and Gleason scores (Table 2). We did not experience difficulty with the urethral catheter exchange end of the UVA in each group. Five patients in Group 1 and no patient in Group 2 experienced the postoperative drain leakage in the present study. The urine leakage was confirmed with using postoperative cystogram. The dranaige was treated with prolonged Foley urethral catheterization. Three of the patients in Group 1 had experienced urinary retention due to bladder neck contracture at a mean follow-up of 4.1 months. All bladder neck contractures were treated using with cold knife incision.

Overall pad usage at 6th month was higher in group 1 than the other group. In group 1 and 2, 78.7% and 93.3% of the patients reported 0 to 1 pads daily, with 21.3% and 6.7% reported ≥ 2 pads daily ($p = 0.002$) (Table 2).

Discussion

Although RARP has tremendously changed the art of performing prostatectomy, LRP still have being routinely performed for localized prostate cancer in many centers that do not have a robot. Laparoscopic intracorporeal suturing is one of the most challenging and time-consuming taks for surgeons (8). In LRP and RARP, the initial results indicated on the technical difficulty on UVA leading to prolonged operation time. The UVA technique was firstly performed with using *Vicryl®* suture on a small 5/8-circle needle in interrupted fashion that was associated with difficulty of multiple knots (18). The difficulties as mentioned above lead to development of continuous UVA techniques that dramatically reduced the number of intracorporeal knots (6). UVA with *Monocryl®* requires follow-through by assistant when continuous anastomosis is performed. An assistant in training may find it difficult to follow-through, leading to loose throws as well as pure-stringing, instrument clashes, and suture entangling around instrument (16).

Intracorporeal suturing with the use of standart suture materials having smooth configuration and placement of knots to secure them is a standard practice. Though widely used these suture's may become loose or entangled, necessitating constant traction by an assistant or repeated tightening of suture by the operating surgeon (5). This may potentially lead to instrument collision, tissue tearing, and purse stringing resulting in prolongation of suturing. To overcome these problems, barbed suture has been introduced into the clinical practice. These self-anchoring knotless sutures incorporate tiny barbs spaced evenly in a helical array on the suture. They require little technical skill to deploy making suturing expeditious, requiring less time than standard suturing (19). Firstly, Weld and associates evaluated the role of barbed suture in urinary tract reconstruction in a porchine model (20). According to in vitro analysis, the authors stated that barbed suture secures tissue approximation at load equivalent to tissue approximation with standard sutures. Later, technical feasibility of UVA using barbed suture was reported by *Moran et al.* in a microfiber synthetic material experimental model; they found barbed suture better than standard *Monocryl®* in terms of faster deployment and higher security score (21).

In the international literature, barbed suture is mainly evaluated in UVA during RARP cases. In a study by Tewari et al, barbed suture (n = 50) and polyglactine suture (n = 50) were used in UVA during RARP (10). They reported that UVA time significantly shorter in barbed suture group. Also, they did not observe clinically significant urine leak or retention in barbed suture group. In a prospective series by *Kaul et al.*, 51 patients underwent UVA during RARP with using barbed suture (11). They reported 27% reduction in UVA time. Also there were no urine leakage at 1 week and no bladder neck stricture. In another recent study, 64 patients underwent UVA during RARP with either barbed suture (n = 31) or monofilament polyglecaprone (n = 33) suture (12). The authors demonstrated that UVA 26% decreased with no increase in the adverse events, no instances of urinary retention. In a study, a total of 84 patients were divided into two groups underwent RARP, undergoing rhabdosphicter reconstruction and UVA using with the *V-Loc®* standard monoflament suture (13). The authors reported that barbed suture associated with a significantly shorter time for UVA compared the standard monofilament suture and is not associated with a higher incidence of clinical urinary leak. At a 9-month follow-up no patients in either group has a clinical bladder neck stricture. Moreover, they found similar urinary continence rates between the groups at 6 weeks (52% and 48%, respectively) and at 6 months (88% and 84%, respectively). The authors concluded that although urinary continence rates in both groups will continue to improve at longer follow-up, it is reasonable to assume the use of barbed suture for the rhabdosphincter reconstruction and the UVA does not affect urinary incontinence. *Zorn et al.* recently published their prospective series in which 30 *V-loc®180* barbed UVA cases during RARP (14). In their analysis, the mean anastomosis time was 14.6 min with using two knotless, interlocked 6-inches 3-0 *V-loc®180* sutures. They did not report urinary leak, urinary retention and urinary incontinence after catheter removal in their patients. Hence the authors concluded that using the interlocked *V-loc®180* suture during RARP for UVA appears to be safe and efficient. In a study by Hemal and co-workers, 50 patients underwent RARP and UVA was performed with using either barbed suture (n = 25) or polyglecaprone suture (n = 25) (16). The authors concluded that barbed suture significantly decreases anastomosis time, hospitalization duration. None of the patient had presented with urine leaks, urinary retention or anastomosis stricture at follow-up of 6 months. In a study by *Manganiello et al.*, a total of 70 patients underwent RARP for prostate cancer (15). In this study, first 35 patients, the UVA was performed using a two separate monofilament sutures. In the subsequent 35 patients, the UVA was performed using two running unidirectional barbed suture. The authors reported that comparing the groups, average

time to complete the anastomosis was similar (27.4 vs. 26.4 minutes, p = 0.73) as was the rate of urinary extravasation on cystogram (5.7% vs. 8.6%, p = 0.65). There were no symptomatic bladder neck contractures noted at 5 months of follow-up.

The authors also reported that at 5th months, rates of urine leak also were comparable. Conversely; in a randomized clinical trial, the authors compared UVA using either barbed polyglyconate (n = 45) or polyglactine 910 (n = 36) sutures in RARP (9). Although baseline characteristics and overall operative times were similar, barbed sutures were associated with shorter mean anastomosis times (9.7 min vs. 9.8 min, p = 0.019). However, they reported more frequent extravasation (20% vs. 2.8%, p = 0.019), longer catheterization time (11.1 d vs. 8.2 d, p = 0.048) and greater suture costs per case (51.5 USD vs. 8.44 USD, p < 0.001) in barbed suture group. The authors concluded that compared to traditional sutures, barbed suture is more costly and requires technical modification to avoid overtightening, delayed healing, and longer catheterization time.

To our knowledge barbed suture has not been evaluated in UVA and total operation time in LRP. Our results showed that barbed suture led to reduced prostatectomy time, UVA time, catheterization duration and lenght of hospital stay in patients underwent LRP. Furthermore, we did not detect postoperative urine leakage from drain and cystogram in barbed suture group. Manganiello and associates previously claimed that barbed suture obviates the need for an assistant to follow the suture to continually reapply tension to previous throws (15). According to their opinion once the bladder neck and urethral tissue are re-approximated, the tissue stays in place and does not migrate unless there is significant counter tension. We believe that this mechanism may facilitate UVA step of the LRP.

In the international literature, urine leaks have been reported to be as high as 6.8% at different centers (22). Urine leaks may result in clinical problems such as bladder neck contraction, infection, bladder neck contracture and urinary incontinence (23). As we mentioned above, some studies reported that urinary incontinence rate were similar between the standard polyglactine and barbed sutures in RARP (13, 14).

In our study, overall pad usage for urinary incontinence at 6th month follow-up was significantly higher in group 1. According to our results, 5 patients in Group 1 experienced the postoperative drain leakage in the present study. The urinary incontinence was seen all of those patients. We believe that urine leakage and bladder neck contracture may fascilitate to develop urinary incontinence.

Conclusions

We therefore consider that by using *V-loc®180* barbed suture running UVA during LRP is associated with a significantly shorter time with maintaining a proper suturing tension compared with standard suture is not associated with a higher incidence of adverse events with no instances of urine leakage, bladder neck contraction, urinary retention and urinary incontinence. In the light of our results, *V-loc®180* barbed suture seems to significantly facilitate the surgeon's duty in UVA during LRP.

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