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Intracorporeal square-to-slip knot technique for vesicourethral anastomosis with single-layer anatomical reconstruction and anterior urethral sphincter preservation

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Radical prostatectomy (RP) remains the gold standard for prostate cancer (PCa) treatment. In recent years, the number of RP procedures has increased, alongside the number of high-risk PCa (HR-PCa) patients choosing this treatment. Consequently, improving functional outcomes while maintaining oncological safety is crucial for this patient group. The rapid development of minimally invasive RP methods has yielded promising new techniques and approaches. However, vesicourethral anastomosis (VUA) continues to be one of the most sophisticated and challenging aspects of the operation.

Aim: to describe and evaluate the safety and efficacy of a VUA technique using intracorporeal square-to-slip knots (IKS), single-layer anatomical reconstruction (SLAR), and anterior smooth muscle urethral sphincter preservation (AUS-P) during extraperitoneoscopic RP (ERP) in terms of urinary continence (UC).

Materials and methods. This study included 36 patients with localized HR-PCa who underwent ERP in 2022 and 2023. The bladder neck preservation (BNP), puboprostatic ligaments (PPL-P), and maximal functional urethra length (MFUL-P), as well as VUA with IKS technique, SLAR and AUS-P, were performed in all cases.

Results. The statistical analysis indicated the safety of the modified VUA technique. The operative time (OT), estimated blood loss (EBL), and hospital stay (HS) medians were within the expected range. Only 15% of patients experienced postoperative complications, all of which were classified as grade I according to the Clavien–Dindo classification. No VUA stenosis was observed after 12 months. 80.6% of patients achieved UC within the first 3 months after urethral catheter removal (CR).

Conclusions. The ISK technique for VUA with SLAR and AUS-P appears to be a safe approach, with promising UC outcomes. Larger studies are needed to confirm the true UC benefits associated with this technique.

Keywords: prostate cancer, radical prostatectomy, vesicourethral anastomosis, intracorporeal square-to-slip knots, urethral sphincter preservation, single-layer anatomical reconstruction of the vesicourethral anastomosis.

Інтракорпоральна квадратно-ковзно-вузлова техніка для везико-уретрального анастомозу з одношаровою анатомічною реконструкцією та презервацією переднього гладком'язового сфінктера уретри

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Радикальна простатектомія (RP) залишається «золотим» стандартом лікування раку передміхурової залози (PCa). Протягом останніх років кількість RP зростає поряд із кількістю хворих на PCa групи високого ризику (HR-PCa), які обирають цей вид лікування. Тому покращення функціональних результатів зі збереженням онкологічної безпеки є вкрай важливим для цієї групи пацієнтів. Стрімкий розвиток мініінвазивних методів RP спонукав до розробки методик та підходів, які забезпечують багатонадійні результати. Однак, везико-уретральний анастомоз (VUA) залишається одним із найскладніших та найвитонченіших елементів операції.

Мета: описати техніку виконання VUA із застосуванням інтракорпоральних квадратно-ковзних вузлів (IKS) із одношаровою анатомічною реконструкцією (SLAR) та презервацією переднього гладком'язового сфінктера уретри (AUS-P) при екстраперитонеоскопічній RP (ERP), оцінити безпеку та ефективність у контексті утримання сечі (UC).

Матеріали та методи. У дослідженні взяло участь 36 пацієнтів із локалізованим HR-PCa, яким протягом 2022–2023 років проводили ERP. Презервацію шийки сечового міхура (BN-P), пубо-простатичних зв'язок (PPL-P) та максимальної функціональної довжини уретри (MFUL-P) виконано у всіх випадках, як і VUA – із застосуванням ISK з SLAR та AUS-P.

Результати. Статистичний аналіз засвідчив безпеку даної модифікації VUA. Медіани тривалості операції (OT), приблизної крововтрати (EBL) та тривалості госпіталізації (HS) були в межах очікуваного діапазону. Лише в 15% випадків констатовано післяопераційні ускладнення, усі в межах I ступеня згідно з класифікацією Clavien–Dindo. У жодного пацієнта не зафіксовано стриктуру VUA протягом 12 місяців спостереження. 80,6% пацієнтів досягли UC протягом перших трьох місяців після видалення уретрального катетера.

Висновки. ISK для виконання VUA зі SLAR та AUS-P є безпечною технікою з багатонадійними результатами в контексті UC. Необхідно провести масштабніші дослідження для підтвердження істинних переваг цієї модифікації VUA в контексті UC.

Ключові слова: рак передміхурової залози, радикальна простатектомія, везико-уретральний анастомоз, інтракорпоральні квадратно-ковзні вузли, презервація сфінктера уретри, одношарова анатомічна реконструкція везико-уретрального анастомозу.

Radical prostatectomy (RP) remains the gold standard for localized prostate cancer (PCa) treatment [15,25]. Recent meta-analysis has shown a significant divergence in mortality risk between non-high-risk and high-risk PCa (HR-PCa) patients [9], with HR-PCa patients facing a significantly elevated risk of PCa-specific mortality. Concurrently, the overall number of RPs performed, particularly for HR-PCa, is increasing [9,23]. This underscores the critical need for developing surgical approaches that optimize functional outcomes without compromising oncological efficacy in this patient population [13,15].

Recent data confirm that minimally invasive surgical approaches and techniques ensure favorable oncological and functional results [6,30]. However, even in the robotic surgery era, vesicourethral anastomosis (VUA) remains one of the most challenging and sophisticated aspects of the intervention, with a significant impact on urinary continence (UC) [1,12,21]. This study presents a modified VUA technique incorporating the intracorporeal square-to-slip knots (ISK), single-layer anatomical reconstruction (SLAR), and anterior smooth muscle urethral sphincter preservation (AUS-P).

The aim of the study is to describe and evaluate the safety and efficacy of the modified VUA technique, using ISK with SLAR and AUS-P during extraperitoneoscopic RP (ERP), in terms of UC.

Materials and methods of the study

This prospective study included 36 patients with localized HR-PCa who underwent ERP in the Urology Department of the Regional Clinical Hospital of Danylo Halytsky Lviv National Medical University in 2022 and 2023. All patients underwent VUA using the ISK technique with AUS-P and SLAR. Preservation of the puboprostatic ligaments (PPL-P), maximal functional urethral length (MFUL-P), and bladder neck (BN-P) with an outlet that did not require reconstruction was achieved in all cases. Exclusion criteria included patients with: anterior tumor growth dominant pattern (TGDP) exhibiting early signs of extraprostatic extension in the projection of the PPL; cases where BN outlet reconstruction was required, or PPL-P, or MFUL-P were not achieved; severe systemic diseases; or finasteride use. Preoperative magnetic resonance imaging (MRI) was used in all cases for surgical planning and staging. All participants provided the informed consent regarding the functional and oncological risks of the proposed surgical approach. UC was assessed at 14 days and 1, 3, 6, 9, and 12 months after urethral catheter removal (CR) by measuring pad weight (PW) and pad number (PN). The statistical analysis was performed using MedCalc's free statistical calculators and STATISTICA version 10 (64-bit).

Surgical procedure. BN-P was performed, combining previously established techniques [3,26]. To minimize oncological risk in this cohort of HR-PCa patients with posterior TGDP, all ERPs were performed extrafascially on the posterolateral aspects. Following the posterolateral dissection, the endopelvic fascia was incised closer to the anterolateral prostate surface to create a dissection plane beneath the PPL, thereby facilitating their preservation and meticulous apical dissection, consistent with previously described techniques [7,25]. DVC was controlled with selective, interrupted sutures, avoiding deep stitches, after the apical dissection and before the urethral division. Once the prostatic-urethral junction was clearly visualized, cold dissection was employed to achieve MFUL-P, adhering to the techniques described before [4,11,22]. Urethral transection was performed within 0.5 cm distal to the colliculus seminalis.

VUA technique. VUA was performed using interrupted Vicryl 3-0 sutures with the ISK technique, following the method described by Meng et al. [17]. Using the ISK technique, sutures could be placed and tied in any order; however, the sequence illustrated in Figure 1 was typically followed.

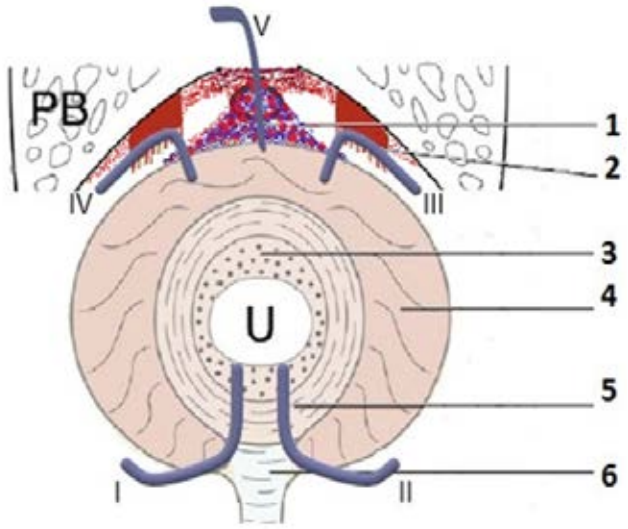

Fig. 1. Schematic view of the VUA formation, adapted from J. Walz et al., 2016. [30]. Key anatomical structures are labeled: PB – pubic bone, U – urethra, 1 – dorsal venous complex (DVC), 2 – puboprostatic ligaments (PPL), 3 – longitudinal smooth muscle of the urethral sphincter, 4 – striated muscle of the urethral sphincter (USS), 5 – circular smooth muscle of the urethral sphincter, 6 – median dorsal raphe. Purple stripes (I – V) indicate suture placement

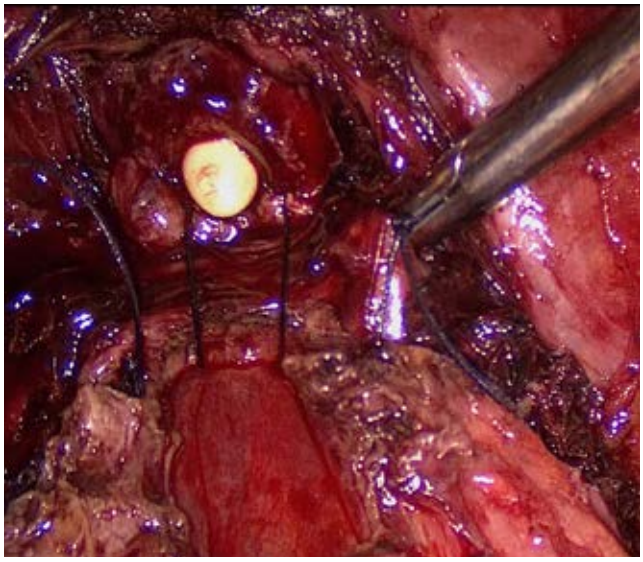

Fig. 2. Close up view of the VUA during posterior aspect formation, demonstrating the suture placements at 5 and 7 o'clock positions

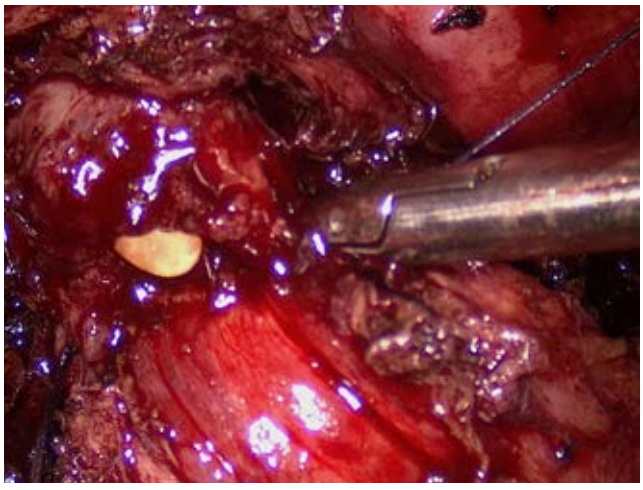

Fig. 3. Close up view of the VUA during suture tightening at the 5 o'clock position

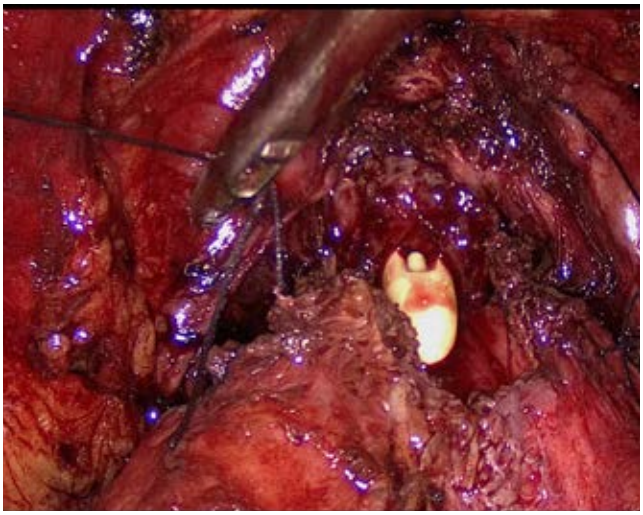

Fig. 4. VUA view during partial suture tightening at the 10 o'clock position

Initial sutures were placed at the 7 and 5 o'clock positions, approximating the posterior detrusor apron (PDA) fragments and the BN with the urethral smooth muscle sphincter, urethral striated sphincter (USS), and Denonvilliers' fascia (DF) fragments (Fig. 2).

Following suture placement, the ISK knots were tightened under direct visual control, ensuring appropriate tension without overtightening on the Denonvilliers' fascia (DF) surface (Fig. 3).

The next two sutures were placed at the 10 and 2 o'clock positions, approximating BN with the superficial layers of the USS, DVC fragments (if present at this level), and PPL. They were only partially tightened to optimize the placement of the 12 o'clock suture, while maintaining sufficient space for easier suturing (Fig. 4).

At the 12 o'clock position, the final suture approximated the BN with the superficial layers of the USS, DVC, and PPL (Fig. 5).

During the final suture tightening, the bladder was distended over the USS and under the PPL, while the suture was tied to the PPL surface (Fig. 6).

VUA watertightness was assessed, and if leakage was observed, additional superficial sutures were placed. No additional suspensions, posterior or anterior reconstructions were performed.

The study was performed in accordance with the principles of the Declaration of Helsinki. The study protocol was approved by the Local Ethics Committee for

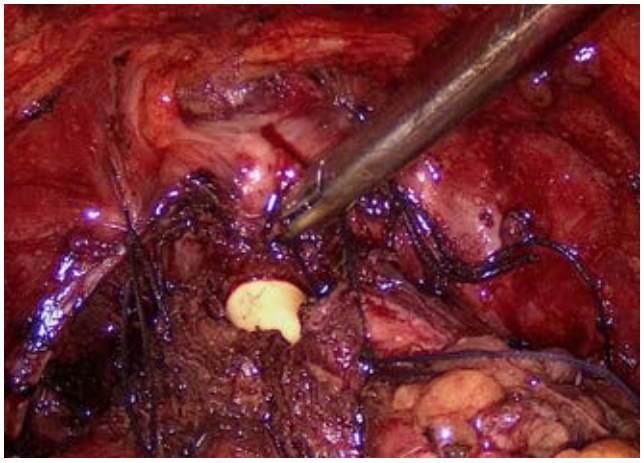

Fig. 5. VUA view before final sutures tightening

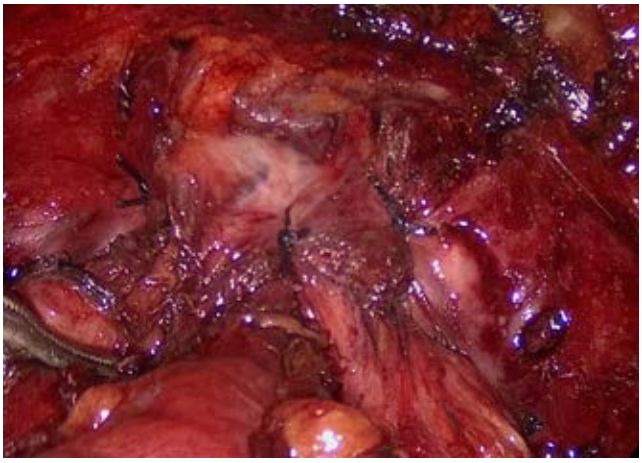

Fig. 6. VUA view after the final sutures tightening

Table 1.
General data of the study group

Parameter	**Me (LQ; UQ)**
Age, years	68 (64.5; 72)
PSA, ng/ml	12.9 (7.95; 26.2)
BMI	28 (23.1; 31.3)
PV, ml	33.8 (30.9; 36)
PIRADS	5 (4; 5)
ISUP	4 (2; 4)
OT, min	127.5 (109; 145.5)
VUAT, min	17 (15; 18.5)
EBL, ml	260 (188; 390)
CR, day	7,5 (7; 9)
HS, day	8,5 (8; 10)
T-stage	**N (%)**
2a	2 (5.6)
2b	5 (13.9)
2c	10 (27.8)
3a	6 (16.6)
3b	13 (36.1)
Gleason score	**N (%)**
3+4	1 (2.8)
4+3	6 (16.7)
4+4	8 (22.2)
3+5	8 (22.2)
5+3	2 (5.6)
4+5	5 (13.8)
5+4	6 (16.7)
IO-VUAL	2 (5.6)
PO-VUAL	2 (5.6)
PSM	6 (16.7)
BCR	3 (8.3)

all participants. The informed consent of the patient was obtained for conducting the studies.

Results of the study

Magnetic resonance imaging (MRI) identification of the tumor growth dominant pattern (TGDP) demonstrated its reliability, with no differences observed compared to the pathomorphological findings after ERP. This result is consistent with our previously published data [19].

The demographic characteristics and pathological outcomes of the study group were typical for HR-PCa patients. 80.5% (n=29) of the patients presented with T2c stage or higher, with positive surgical margins (PSM) in 16.7% (n=6) of cases, primarily resulting from perineural invasion. However, biochemical recurrence (BCR), defined as a PSA level above 0.2 ng/mL, was observed in 2 (5.6%) cases during the 12-month follow-up period. The CR and hospital stay (HS) medians were 7.5 and 8.5 days, respectively. The VUA time (VUAT) and the operative time (OT) medians were 17 and 127.5 minutes, respectively, both were within the expected range. There were no reported intraoperative complications or bleeding issues, with a median estimated blood loss (EBL) of 260 ml. The postoperative complication rate was 15%, with all complications classified as grade I according to the Clavien-Dindo classification. Intraoperative VUA leakage (IO-VUAL) was observed in 2 (5.6%) cases and was corrected by placing a single, superficial suture. No VUA stenosis was observed after 12 months of follow-up. However, in 2 (5.6%) cases, CR was postponed to the 10th and 12th days due to postoperative urine leakage (PO-VUAL). The general data of the study group are presented in Table 1.

Table 2 presents UC results, categorized by pad usage and weight. 33.3% (n=12), 75% (n=27), and 83.3% (n=30) of participants achieved 0-1 pad continence at two weeks, one and three months after urethral catheter removal, respectively. The median pad weights were 207 g at two weeks,

Table 2
Urinary continence results

Time period after UC removal	0-1 pad, N of patients (%)	2 pads or more, N of patients (%)	PW gr, Me (LQ; UQ)
2 weeks	12 (33.3)	24 (66.7)	207 (81; 298)
1 month	27 (75)	9 (25)	106 (60; 227)
3 month	30 (83.3)	6 (16.7)	71 (0; 136)
6 month	32 (88.9)	4 (11.1)	57 (0; 110)
9 month	33 (91.7)	3 (8.3)	0 (0; 93)
12 month	34 (94.4)	2 (5.6)	0 (0; 41)

106 g at one month, and 71 g at three months. Nevertheless, 2 (5.6%) patients did not achieve full UC by 12 months.

Disscusion

This study introduces a modified VUA technique, utilizing the ISK technique, that integrates SLAR and AUS-P. This modification aims to mitigate VUA creation difficulties during ERP and improve UC. As previously established, VUA remains a technically demanding aspect of RP, particularly during ERP, where anatomical variations can limit the surgical field [5,8,12,21]. The ISK technique allows knot formation distant from the VUA under more comfortable conditions and enables tying and ligation in a flexible sequence. Sutures can also be placed in any sequence and direction, but typically in the order described above. Incorporating DF, DVC, and PPL into the sutures provides additional anatomical support to the VUA, replicating the principles of posterior and anterior reconstruction [27,29]. SLAR of the VUA was previously described by S. Sengupta et al. [24]. However, in that study, the VUA was performed using a running suture technique, which requires the application of more stitches. In contrast, this modified technique requires only five interrupted sutures for VUA creation. A further distinction of this technique is its emphasis on AUS-P, which closely resembles the approach described by J. Stolzenburg et al. [26]. While also sharing similarities with the VUA technique described by L. Antonelli et al. [2] in the context of AUS-P, this technique differs in surgical approach, anatomical restoration principles, and suturing technique. The reduced number of sutures may have benefits in terms of healing and potentially shorten operative time, as suggested by [14,16]. An additional and significant benefit of the ISK technique is the opportunity to establish appropriate, controlled tension during VUA approximation, guided by direct visual control. Some data suggests that surgeon experience may influence the occurrence of overtightening when performing a running VUA with barbed sutures [10,20,32,33]. Conversely, insufficient tension leads to poor VUA watertightness and PO-VUAL, which may result in longer hospital stays, delayed urethral catheter removal, and subsequent fibrosis [28]. Only two cases (5.6%) in this patient cohort required additional superficial sutures to achieve watertight VUA, with no leakage observed from the posterior VUA side. The UC results in this study are promising, but may still be associated with anatomical structures preservation and surgical technique itself, rather than the VUA technique [13,18]. The safety of this technique was confirmed by the study results. However, further analyses are planned to clarify the true UC benefits associated with this technique.

Conclusions

The ISK technique for VUA with SLAR and AUS-P appears to be a safe approach, with promising UC outcomes. Larger studies are needed to confirm the true UC benefits associated with this technique.

The author declares no conflict of interest.

References/Література

1. Albisinni S, Limani K, Hawaux E, Peltier A, Van Velthoven R. (2014). Evaluation of the Single-Knot Running Vesicourethral Anastomosis 10 Years After Its Introduction: Results from an International Survey. J Laparoendosc Adv Surg Tech A. 24(9): 640-646. https://doi.org/10.1089/lap.2014.0129.
2. Antonelli L, Afferi L, Mattei A, Fankhauser CD. (2023). Anterior Sphincter-sparing Suturing of the Vesicourethral Anastomosis During Robotic-assisted Laparoscopic Radical Prostatectomy. Eur Urol Open Sci. 52: 109-114. https://doi.org/10.1016/j.euros.2023.04.007.
3. Asimakopoulos AD, Mugnier C, Hoepffner JL, Piechaud T, Gaston R. (2012) 'Bladder neck preservation during minimally invasive radical prostatectomy: a standardised technique using a lateral approach'. BJU International. 110(10): 1566-1571. https://doi.org/10.1111/j.1464-410X.2012.11604.x.
4. Bianchi L, Turri FM, Larcher A, De Groote R, De Bruyne P, De Coninck V et al. (2018). A Novel Approach for Apical Dissection During Robot-assisted Radical Prostatectomy: The «Collar» Technique. Eur Urol Focus. 4(5): 677-685. https://doi.org/10.1016/j.euf.2018.01.004.
5. Cathelineau X, Cahill D, Widmer H, Rozet F, Baumert H, Vallancien G et al. (2004). Transperitoneal or Extraperitoneal Approach for Laparoscopic Radical Prostatectomy: A False Debate Over a Real Challenge. J Urol. 171(2): 714-716. https://doi.org/10.1097/01.ju.0000103885.71434.02.
6. Checcucci E, De Cillis S, Alladio E, Piramide F, Volpi G, Granato S et al. (2024). Ten-year functional and oncological outcomes of a prospective randomized controlled trial comparing laparoscopic versus robot-assisted radical prostatectomy. Prostate. 84(9): 832-841. https://doi.org/10.1002/pros.24702.

7. Covas Moschovas M, Bhat S, Onol FF, Rogers T, Roof S, Mazzone E et al. (2020). Modified Apical Dissection and Lateral Prostatic Fascia Preservation Improves Early Postoperative Functional Recovery in Robotic-assisted Laparoscopic Radical Prostatectomy: Results from a Propensity Score – matched Analysis. Eur Urol. 78(6): 875-884. https://doi.org/10.1016/j.eururo.2020.05.041.
8. Erdogru T, Teber D, Frede T, Marrero R, Hammady A, Seemann O et al. (2004). Comparison of Transperitoneal and Extraperitoneal Laparoscopic Radical Prostatectomy Using Match-Pair Analysis. Eur Urol. 46(3): 312-320. https://doi.org/10.1016/j.eururo.2004.05.004.
9. Falagario UG, Knipper S, Pellegrino F, Martini A, Akre O, Egevad Let al. (2024). Prostate Cancer – specific and All-cause Mortality After Robot-assisted Radical Prostatectomy: 20 Years' Report from the European Association of Urology Robotic Urology Section Scientific Working Group. Eur Urol Oncol. 7(4): 705-712. https://doi.org/10.1016/j.euo.2023.08.005.
10. Haga N, Kurita N, Yanagida T, Ogawa S, Yabe M, Akaihata H et al. (2018). Effects of barbed suture during robot-assisted radical prostatectomy on postoperative tissue damage and longitudinal changes in lower urinary tract outcome. Surg Endosc. 32(1): 145-153. https://doi.org/10.1007/s00464-017-5649-z.
11. Hamada A, Razdan S, Etafy MH, Fagin R, Razdan S et al. (2014). Early Return of Continence in Patients Undergoing Robot-Assisted Laparoscopic Prostatectomy Using Modified Maximal Urethral Length Preservation Technique. J Endourol. 28(8): 930-938. https://doi.org/10.1089/end.2013.0794.
12. Lu H, Yu C, Yu X, Yang D, Yu S, Xia L et al. (2024). Effects of Bony Pelvic and Prostate Dimensions on Surgical Difficulty of Robot-Assisted Radical Prostatectomy: An Original Study and Meta-analysis. Ann Surg Oncol. 31(12): 8405-8420. https://doi.org/10.1245/s10434-024-15769-w.
13. Ippoliti S, Colalillo G, Egbury G, Orecchia L, Fletcher P, Piechaud T et al. (2023). Continence-Sparing Techniques in Radical Prostatectomy: A Systematic Review of Randomized Controlled Trials. J Endourol. 37(10): 1088-1104. https://doi.org/10.1089/end.2023.0188.
14. Köhler N, El-Bandar N, Maxeiner A, Ralla B, Miller K et al. (2020). Early Continence and Extravasation After Open Retropubic Radical Prostatectomy – Interrupted vs Continuous Suturing for Vesicourethral Anastomosis. Ther Clin Risk Manag, 16: 1289-1296. https://doi.org/10.2147/TCRM.S278454.
15. Martini A, Falagario UG, Villers A, Dell'Oglio P, Mazzone E, Autorino Ret al. (2020). Contemporary Techniques of Prostate Dissection for Robot-assisted Prostatectomy. Eur Urol, 78(4): 583-591. https://doi.org/10.1016/j.eururo.2020.07.017.
16. Mazaris EM, Chatzidarellis E, Varkarakis IM, Dellis A, Deliveliotis C. (2009). Reducing the number of sutures for vesicourethral anastomosis in radical retropubic prostatectomy. Int Braz J Urol, 35(2): 158-163. https://doi.org/10.1590/S1677-55382009000200005.
17. Meng MV, Stoller ML. (2002). Laparoscopic intracorporeal square-to-slip knot. Urology, 59(6): 932-933. https://doi.org/10.1016/S0090-4295(02)01517-0.
18. Michl U, Tennstedt P, Feldmeier L, Mandel P, Oh SJ, Ahyai S et al. (2016). Nerve-sparing Surgery Technique, Not the Preservation of the Neurovascular Bundles, Leads to Improved Long-term Continence Rates After Radical Prostatectomy. Eur Urol. 69(4): 584-589. https://doi.org/10.1016/j.eururo.2015.07.037.
19. Nakonechnyi YA, Mytsyk YuO, Borzhievskyi ATs. (2024). PCA3 score prognostic value for identifying postoperative ISUP grades 4-5 in localized peripheral zone prostate cancer with a posterior tumor growth dominant pattern. Paediatric Surgery (Ukraine). 4(85): 65-70. doi: 10.15574/PS.2024.4(85).6575.
20. Rajih E, Meskawi M, Alenizi AM, Zorn KC, Alnazari M, Borhan W et al. (2019). Long-term urinary functional outcome of vesicourethral anastomosis with bidirectional poliglecaprone (Monocryl®) vs. barbed polyglyconate suture (V-LocTM 180) in robot-assisted radical prostatectomy. Can Urol Assoc J. 14(3). https://doi.org/10.5489/cuaj.5959.
21. Samavedi S, Abdul-Muhsin H, Pigilam S, Sivaraman A, Patel VR. (2014). Handling difficult anastomosis. Tips and tricks in obese patients and narrow pelvis. Indian J Urol, 30(4): 418. https://doi.org/10.4103/0970-1591.142070.
22. Schlomm T, Heinzer H, Steuber T, Salomon G, Engel O, Michl U et al. (2011). Full Functional-Length Urethral Sphincter Preservation During Radical Prostatectomy. Eur Urol, 60(2): 320-329. https://doi.org/10.1016/j.eururo.2011.02.040.
23. Seetharam Bhat KR, Seetharam Bhat KR, Moschovas MC, Onol FF, Sandri M, Rogers T, Roof S et al. (2020). Trends in clinical and oncological outcomes of robot-assisted radical prostatectomy before and after the 2012 US Preventive Services Task Force recommendation against PSA screening: a decade of experience. BJU Int, 125(6): 884-892. https://doi.org/10.1111/bju.15051.
24. Sengupta S, Ischia J, Webb DR. (2011). Single-layer anatomical reconstruction of the vesico-urethral anastomosis during robot-assisted laparoscopic prostatectomy (RALP). BJU Int, 107(2): 340-343. https://doi.org/10.1111/j.1464-410X.2010.09960.x.
25. Sood A, Jeong W, Peabody JO, Hemal AK, Menon M. (2014). Robot-Assisted Radical Prostatectomy. Urol Clin North Am, 41(4): 473-484. https://doi.org/10.1016/j.ucl.2014.07.002.
26. Stolzenburg J, McNeill A, Liatsikos EN. (2008). Nerve-sparing endoscopic extraperitoneal radical prostatectomy. BJU Int, 101(7): 909-928. https://doi.org/10.1111/j.1464-410X.2008.07544.x.
27. Tan G, Srivastava A, Grover S, Peters D, Dorsey P Jr, Scott A et al. (2010). Optimizing Vesicourethral Anastomosis Healing After Robot-Assisted Laparoscopic Radical Prostatectomy: Lessons Learned from Three Techniques in 1900 Patients. J Endourol, 24(12): 1975-1983. https://doi.org/10.1089/end.2009.0630.
28. Velthoven RFV. (2008). Optimization of the Vesicourethral Anastomotic Model in Laparoscopic Prostatectomy Performed on Large Prostates. J Endourol, 22(9): 1999-2000. https://doi.org/10.1089/end.2008.9758.
29. Vis AN, van der Poel HG, Ruiter AEC, Hu JC, Tewari AK, Rocco B et al. (2019). Posterior, Anterior, and Periurethral Surgical Reconstruction of Urinary Continence Mechanisms in Robot-assisted Radical Prostatectomy: A Description and Video Compilation of Commonly Performed Surgical Techniques. Eur Urol, 76(6): 814-822. https://doi.org/10.1016/j.eururo.2018.11.035.
30. Von Ahlen C, Geissler A, Vogel J. (2024). Comparison of the effectiveness of open, laparoscopic, and robotic-assisted radical prostatectomies based on complication rates: a retrospective observational study with administrative data from Switzerland. BMC Urol, 24(1): 215. https://doi.org/10.1186/s12894-024-01597-3.
31. Walz J, Epstein JI, Ganzer R, Graefen M, Guazzoni G, Kaouk J et al. (2016). A Critical Analysis of the Current Knowledge of Surgical Anatomy of the Prostate Related to Optimisation of Cancer Control and Preservation of Continence and Erection in Candidates for Radical Prostatectomy: An Update. Eur Urol, 70(2): 301-311. https://doi.org/10.1016/j.eururo.2016.01.026.
32. Weld KJ, Ames CD, Hruby G, Humphrey PA, Landman J. (2006). Evaluation of a novel knotless self-anchoring suture material for urinary tract reconstruction. Urology, 67(6): 1133-1137. https://doi.org/10.1016/j.urology.2005.12.022.
33. Williams SB, Alemozaffar M, Lei Y, Hevelone N, Lipsitz SR et al. (2010). Randomized Controlled Trial of Barbed Polyglyconate Versus Polyglactin Suture for Robot-Assisted Laparoscopic Prostatectomy Anastomosis: Technique and Outcomes. Eur Urol, 58(6): 875-881. https://doi.org/10.1016/j.eururo.2010.07.021.

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