KUROWSKI, Marek, KUCZAPSKA, Karolina, GLIWA, Anna, RYGLEWICZ, Monika, FABIAN, Dariusz, LESZCZYŃSKA-KNAGA, Elżbieta, JAKUBCZYK, Natalia, RUTKOWSKA-KAWALEC, Weronika, MOCZYDŁOWSKI, Paweł and MICHALCZUK, Karolina. Robot-assisted radical prostatectomy with da Vinci single-port system. Journal of Education, Health and Sport. 2025;77:56945. eISSN 2391-8306.
https://doi.org/10.12775/JEHS.2025.77.56945
https://apcz.umk.pl/JEHS/article/view/56945

The journal has had 40 points in Minister of Science and Higher Education of Poland parametric evaluation. Annex to the announcement of the Minister of Education and Science of 05.01.2024 No. 32318. Has a Journal's Unique Identifier: 201159. Scientific disciplines assigned: Physical culture sciences (Field of medical and health sciences); Health Sciences (Field of medical and health sciences).
Punkty Ministerialne 40 punktów. Załącznik do komunikatu Ministra Nauki i Szkolnictwa Wyższego z dnia 05.01.2024 Lp. 32318. Posiada Unikatowy Identyfikator Czasopisma: 201159. Przypisane dyscypliny naukowe: Nauki o kulturze fizycznej (Dziedzina nauk medycznych i nauk o zdrowiu); Nauki o zdrowiu (Dziedzina nauk medycznych i nauk o zdrowiu).
The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 20.12.2024. Revised: 07.01.2025. Accepted: 07.01.2025. Published: 08.01.2025.

Robot-assisted radical prostatectomy with da Vinci single-port system

1. Marek Kurowski [MK]
Independent Public Health Care Facility of the Ministry of Internal Affairs and Administration in Łódź, Północna 42 street, 91-425 Łódź, Poland
https://orcid.org/0009-0008-2831-3312
kmarek072@gmail.com
2. Karolina Kuczapska [KK]
University Clinical Hospital No. 4 in Lublin, Dr. Kazimierz Jaczewski 8 street, 20-954 Lublin, Poland
https://orcid.org/0000-0002-5921-1094
zgodzinka@gmail.com
3.Anna Gliwa [AG]
Jan Mikulicz-Radecki University Clinical Hospital in Wrocław, Borowska 213 street, 50-556 Wrocław, Poland
https://orcid.org/0009-0006-0251-0591
annagliwa97@gmail.com

4. Monika Ryglewicz [MR]
J.Popiełuszka Bielan Hospital, Independent Public Health Care Center, Cegłowska 80 street, 01-809 Warsaw, Poland
https://orcid.org/0009-0006-1063-2265
mjm.ryglewicz@gmail.com

5. Dariusz Fabian [DF]
Specialist Provincial Hospital in Ciechanów, Powstańców Wielkopolskich 2 street, 06-400 Ciechanów
https://orcid.org/0009-0006-7241-7245
dfabianstudy@gmail.com

6. Elżbieta Leszczyńska- Knaga [ELK]
Megrez Provincial Specialist Hospital, Edukacja 102 street, 43-100 Tychy, Poland
https://orcid.org/0009-0007-5584-8614
e.leszczynska.knaga@interia.pl

7. Natalia Jakubczyk [NJ]
Independent Public Health Care Facility of the Ministry of Internal Affairs and Administration in Łódź, Północna 42 street, 91-425 Łódź, Poland
https://orcid.org/0009-0008-3190-4658
nataliajakubczyk1@gmail.com

8. Weronika Rutkowska- Kawalec [WRK]
Dr. Tytus Chałubiński District Hospital in Zakopane, Kamieniec 10 street, 34-500 Zakopane, Poland
https://orcid.org/0009-0002-4283-6458
weronikarut32@gmail.com

9. Paweł Moczydłowski [PM]
G. Narutowicz Municipal Specialist Hospital, Prądnicka 35 street, 31-202 Kraków, Poland
https://orcid.org/0009-0007-1555-2958

moczdlowski.pk@gmail.com

10. Karolina Michalczuk [KM]
5th Military Clinical Hospital with Polyclinic, Wrocławska 1/3 street, 30-901 Kraków, Poland
https://orcid.org/0000-0002-4427-9133
karolina.michalczuk14@gmail.com

ABSTRACT

Introduction and purpose

Prostate cancer is the most common malignant tumor in men in Poland. In 2021, the standardized incidence rate was 48.2 cases per 100,000 people. It is diagnosed mainly in men over 60 years of age. The choice of treatment method depends on the stage of the disease, general condition and age of the patient. Treatment mainly includes surgery, radiotherapy and hormone therapy. In the case of surgical procedures, it is possible to perform prostate cancer surgery using the Da Vinci single-port surgical robot. The aim of this literature review is to describe the procedure of radical prostatectomy using the da Vinci single-port robot and to assess the effectiveness of radical prostatectomy using the da Vinci single-port robot compared to open and laparoscopic prostatectomy.

Material and methods

This review of studies was based on articles obtained from the scientific database PubMed. Key search terms included prostate cancer; robot-assisted radical prostatectomy; robotic surgery; da Vinci Surgical System; da Vinci single-port; laparoscopic prostatectomy; open prostatectomy.

Conclusions

Currently, the da Vinci single-port surgical system is playing an increasingly important role in radical prostatectomy centers. It is increasingly replacing open radical prostatectomies due to its higher treatment efficacy and fewer complications. However, no significant differences have been demonstrated compared to classical laparoscopic surgery. Further studies are also necessary to assess functional and oncological results.

Keywords: prostate cancer; robot-assisted radical prostatectomy; robotic surgery; da Vinci Surgical System; da Vinci single-port; laparoscopic prostatectomy; open prostatectomy.

Introduction

Prostate cancer is the most common malignant tumor in men in Poland and, according to statistical data, it accounts for 20% of all malignant tumors. In 2021, the standardized incidence rate was 48.2 cases per 100,000 people (1st place among cancer cases in men; 17,832 cases), and the mortality rate was 13.1 cases per 100,000 people (5,458 deaths - 2nd place among causes of cancer deaths in men) [1]. According to the data, currently about 10 million men live with this disease, and about 700,000 of them have been diagnosed with metastatic disease [2]. Early diagnosis of prostate cancer is very important, because early detection of the disease and rapid implementation of treatment means that the life expectancy of men with localized prostate cancer can be up to 99% for more than 10 years [3]. About 5% of men diagnosed with prostate cancer also have distant metastases, often located in multiple organs, and 15% of men have regional metastases to nearby organs or lymph nodes [4]. Due to the high incidence of prostate cancer in the population, there is an urgent need for effective and targeted treatment of this cancer. According to studies, active surveillance, a structured program that uses monitoring and targeted intervention as the basic techniques of prostate cancer treatment, is very important. It helps to control the course of the disease, implement appropriate treatment at specific stages, and minimize potential complications. This method is preferred in patients with low-risk cancers or those who have a short life expectancy. The criteria for active surveillance include recommendations based on the following factors: health status, disease characteristics, life expectancy, side effects, and patient preferences [5]. The important indicators in the treatment of prostate cancer are used: prostate-specific antigen (PSA) level, clinical and histological progression [6]. Among the numerous treatment methods, such as surgery, hormonal therapy, chemotherapy, radiotherapy, brachytherapy, cryotherapy, one of the most important is undoubtedly the da Vinci single-port radical prostatectomy. The main objective of this literature review is to describe the procedure of the da Vinci single-port radical prostatectomy and to evaluate the efficacy of the da Vinci single-port radical prostatectomy compared to open and laparoscopic prostatectomy.

Methodology

This review of studies was based on articles obtained from the scientific database PubMed. Key search terms included prostate cancer; robotic-assisted radical prostatectomy; robotic surgery; da Vinci surgical system; single-port da Vinci; laparoscopic prostatectomy; open prostatectomy.

Prostate cancer

Prostate cancer is a malignant tumor that develops in the prostate gland. It is worth adding that most prostate cancers are asymptomatic and grow slowly. Symptoms usually appear when prostate cancer is quite advanced locally and may then occur such complaints as weak or interrupted urine flow, pain in the lower abdomen and perineum, a burning sensation during urination, polyuria, a feeling of incomplete urination, urgency to urinate, difficulty in initiating micturition, nocturia, painful ejaculation. Prostate cancer usually occurs in men over the age of 60. Risk factors associated with the development of prostate cancer include family factors, African descent, obesity, a high-fat diet and lack of physical activity. The 5-year survival rate for prostate cancer is relatively good and is about 96% [1,7]. According to studies, in 70% of cases, cancer develops in the peripheral part of the prostate gland, often in multiple locations. In the initial phase of the disease, which can last for many years, the tumor is limited to the organ and does not cause any symptoms. In the second phase, the invasive phase of the disease, it invades neighboring tissues and organs, spreading along the perineural spaces. Metastases then occur through lymphatic and blood vessels. Regional lymph nodes are affected, and distant metastases usually occur in the bones, less frequently in the liver, lungs, and brain [1]. In the diagnosis of prostate cancer, digital rectal examination (DRE) is used to assess the structure, stiffness, and enlargement of the prostate. The basic parameter is the level of prostate-specific antigen (PSA), which serves as a screening test in the diagnosis of this cancer. In the case of suspected cancer, a biopsy of the gland is performed under transrectal ultrasound (TRUS) guidance to make a histopathological diagnosis. The biopsy should include samples from each lobe of the prostate and should be directed to potential tumor foci located and previously described in magnetic resonance imaging. The histological grade is determined according to the Gleason classification. Magnetic resonance imaging (MRI) plays a key role in diagnostic imaging. Multiparametric MRI (mpMRI) has been widely used in the treatment of localized prostate cancer in recent years [8]. In recent years, genetic testing and hereditary testing of prostate cancer are increasingly performed due to the significant development of such genetic diagnostic methods as mRNA sequencing, whole genome DNA sequencing and proteome profiling [9,10]. Common genes used as biomarkers of prostate cancer are BRCA genes, HOX genes, ATM gene, RNase L (HPC1, lq22), MSR1 (8p) and ELAC2/HPC2 (17p11). Biomarkers are used in diagnostic procedures, in determining the stage of the disease, assessing the aggressiveness of the disease and assessing the therapeutic process [11]. There are many treatment options for prostate cancer. The most important of them is hormone therapy, also known as androgen deprivation therapy (ADT). This technique is used to treat advanced and metastatic prostate cancer. Its therapeutic mechanism is based on blocking the production of testosterone and other male hormones, preventing them from feeding prostate cancer cells [12]. Other methods include chemotherapy and radiotherapy. Chemotherapy involves the use of anticancer drugs to kill or stop the growth of cancer cells. The most common chemotherapy drug for prostate cancer is docetaxel (Taxotere) [13]. External beam radiotherapy (EBRT) is a commonly used treatment technique that involves the emission of powerful X-ray beams specifically aimed at prostate tissue [14]. Cryotherapy and brachytherapy are also used to treat cancer. Cryotherapy involves the surgical insertion of cryoprobes into the prostate under ultrasound guidance. It involves freezing the prostate gland to a temperature of −100 °C to −200 °C for about 10 minutes. Brachytherapy is the direct placement of radioactive particles into the prostate gland using injections or wires guided by transrectal ultrasound. [15,16]. Due to drug resistance and adverse effects, the use of the above methods in monotherapy is becoming increasingly rare, and combined therapy is often used, in which, for example, radiotherapy is combined with chemotherapy. Numerous studies are also being conducted on the use of medicinal plants, gene therapy and the use of nanotechnology in treatment, which may be the future of prostate cancer treatment. However, it still requires many experimental studies and observations [11]. Surgical methods include radical prostatectomy. Radical prostatectomy is a medical procedure of removing the prostate gland using an open or laparoscopic method. The procedure requires making small incisions on the abdomen or through the perineum [11,17]. For surgical treatment, one of the following is selected: laparoscopic radical prostatectomies, robot-assisted radical prostatectomy (RARP) or open radical prostatectomy (RP). As for the operation using a robot, the da Vinci robot is currently most commonly used. The da Vinci robot-assisted radical prostatectomy is divided into multi-port or single-port [18].

da Vinci single-port surgery- technique description

The da Vinci Surgical System from Intuitive Surgical is currently the most widely used robotic surgery system and uses a master-slave console that allows the surgeon to operate remotely from the surgical site. This system has attracted increasing interest in the medical community and is being used in an increasing number of surgical procedures [19,20]. The da Vinci Surgical System consists of four main components: a surgical console, which is used by the surgeon and views a magnified 3D image of the surgical site; a patient cart, which consists of three arms with instruments and one endoscope (a tubular optical instrument for viewing the interior of the body); mobile instruments, which are used to simulate fine motor movements of a human; and a 3D vision system [21]. Preoperative preparation includes subcutaneous administration of heparin and antibiotic prophylaxis (e.g., cephalosporin). At the beginning of the procedure, the patient is placed in the Trendelenburg position under general anesthesia with an exaggerated dorsal lithotomy and pads around all joints and extremities. In addition, a belt is placed around the chest to stabilize the patient and ensure the patient's safety in the Trendelenburg position. A semilunar incision of a few centimeters is then made periumbilically below the umbilicus. The abdominal wall is then carefully dissected until the anterior fascia of the rectus abdominis muscle is reached, which is then incised with electrocautery. The next step is to insert the index finger through the fascial incision to create the initial preperitoneal space. A balloon dilator is placed under the anterior fascia of the rectus abdominis muscle toward the pubic symphysis and approximately 400 ml of air is pumped in each time to enlarge the preperitoneal working space. A single-point port is then carefully inserted into the space using forceps. Kelly or Cadiere forceps may be used. Appropriate hydration may be used during this process to minimize tissue trauma. Then, an additional 8 mm or 12 mm port is placed in the right or left lower quadrant of the abdomen [22,23]. As reported by K. Kim in his studies, two surgical tips can be used to more effectively use the da Vinci SP system in surgery. First, the operation can be performed using two positions of the robotic arm to ensure effective retraction. Depending on the primary direction of retraction, the retraction arm (Cadiere forceps) is placed above (12 o'clock) or below (6 o'clock), and the camera is placed in the opposite position. Second, the "floating trocar" technique can be used to achieve flexibility in the distance between the trocar and the target anatomy to triangulate the robotic arms [24]. Single-port technique using the same concept and steps as in multi-port surgery, Marcio Covas Moschovas distinguished in his work the individual steps of prostatectomy: stabilization of trocars, possible release of adhesions, lowering of the bladder and access to the Retzius space, anterior dissection of the bladder neck, dissection of the posterior bladder neck and access to the seminal vesicles, nerve sparing (posterior approach and lateral dissection); control of the prostatic pedicle with hem-o-lock clips, minimal apical dissection, control of the dorsal venous complex with the use of a running suture and division of the urethra, posterior reconstruction and anastomosis, lymphadenectomy [25, 26].

Evaluation of treatment effectiveness

The primary purpose of the da Vinci robotic-assisted single-port radical prostatectomy is to maintain the benefits of minimally invasive surgery while maximizing: prostate cancer control, continence (the ability to voluntarily control urine production), and erectile function (the ability to achieve or maintain an erection during sexual activity). The minimally invasive nature of the da Vinci robotic procedure provides several advantages that favor this type of surgery. The use of a robotic system allows for greater precision during the procedure, increased operator dexterity, three-dimensional imaging, and provides an ergonomic position for the operating surgeon. The ergonomics of the robotic system allow experienced but aging surgeons to improve and maintain their surgical skills. Therefore, it does not exclude and encourages the development of all surgeons. Compared to an open radical prostatectomy, which is performed through a 6-8 cm incision, the robotic-assisted single-port radical prostatectomy requires two incisions ranging from just 5 to 12 mm in length. This is of great importance both in terms of less traumatization of the skin and subcutaneous tissues, as well as faster healing and better cosmetic effect for the patient [21]. This is confirmed by studies taking into account the opinions of patients who prefer the minimally invasive nature of robot-assisted radical prostatectomy over open radical prostatectomy due to smaller scars, faster recovery and better perioperative results [27,28]. When assessing the quality and results of the performed procedures, robot-assisted radical prostatectomy should be compared separately with open and laparoscopic surgery. Comparison of robot-assisted radical prostatectomy with open radical prostatectomy has shown shorter operative time, shorter hospital stay, reduced blood loss and therefore fewer blood transfusions, reduced complication and mortality rates and a lower risk of anastomotic strictures in favor of robot-assisted prostatectomy [21]. Cancer control results seem to be similar, although studies with a longer follow-up period are needed [29,30]. However, when comparing robot-assisted radical prostatectomy with laparoscopic radical prostatectomy, there were equivocal results regarding voiding and erectile function, no differences in health-related quality of life, no differences in positive surgical margins or biochemical recurrence, no significant reduction in blood loss, transfusion rate, catheterization time, or complication rate, and no significant reduction in operative time or length of hospital stay [21]. It is also worth examining the disadvantages and difficulties that arise with the use of the da Vinci robot. One of the disadvantages of the robotic system is that while it assists the surgeon in precise tissue manipulation and allows for greater precision and accuracy, the surgeon only experiences the visualization during the operation. In contrast, in the case of laparoscopic and open radical prostatectomy, the surgeon feels real contact with the tissues—their structure, hardness, susceptibility to damage. The use of the da Vinci robot requires appropriately qualified personnel and more physical space in the operating rooms. RARP has also been criticized for its high cost of equipment and disposables that cannot be disinfected, and for its minimal, if any, oncologic or functional benefits compared with open radical prostatectomy [31,32]. Further studies will be needed to evaluate the potential benefits of this approach as well as functional and oncologic results [33].

Conclusions

Radical prostatectomy is increasingly being performed for the treatment of prostate cancer patients, with the robotic approach accounting for the majority of procedures in the United States and Europe. As a result, laparoscopic instruments and techniques are continually being refined, as the ability to perform minimally invasive procedures is essential in modern medicine. For example, the single-port da Vinci robotic system is playing an increasingly important role in radical prostatectomy centers. It is increasingly replacing open radical prostatectomies because of its many advantages, including reduced blood loss, fewer blood transfusions and perioperative complications, reduced mortality, shorter hospital stay, more stable anastomoses, improved cosmesis, reduced pain management requirements, and improved operative visualization during critical stages of the procedure. However, when comparing robotic surgery to laparoscopic surgery, there is no significant difference in favor of the robotic procedure. It is also worth adding that operations with the da Vinci single-port robot compared to traditional surgical methods, the da Vinci system is significantly more expensive, requires appropriately qualified personnel and more physical space in operating rooms. Further studies will be necessary to assess the functional and oncological results after robotic radical prostatectomy.

Author's contribution

Conceptualization, Marek Kurowski, Karolina Kuczapska and Anna Gliwa; methodology, Monika Ryglewicz; software, Paweł Moczydłowski; check, Paweł Moczydłowski, Weronika Rutkowska- Kawalec and Natalia Jakubczyk; formal analysis, Elżbieta Leszczyńska- Knaga and Dariusz Fabian; investigation, Marek Kurowski and Karolina Michalczuk; resources, Karolina Kuczapska; data curation, Weronika Rutkowska- Kawalec; writing - rough preparation, Marek Kurowski; writing - review and editing, Marek Kurowski, Monika Ryglewicz; visualization, Marek Kurowski; supervision, Natalia Jakubczyk; project administration, Dariusz Fabian; receiving funding, Anna Gliwa

All authors have read and agreed with the published version of the manuscript.

Funding statement

The study did not receive special funding

Informed Consent Statement

Not applicable

Acknowledgments

Not applicable

Conflict of Interest Statement

The authors report no conflict of interest.

References:

[1] www.mp.pl/interna/chapter/B01.X.G.2.

[2] Sandhu S., Moore C.M., Chiong E., Beltran H., Bristow R.G., Williams S.G. Prostate cancer. Lancet. 2021;398:1075–1090. doi: 10.1016/S0140-6736(21)00950-8

[3] Rebello RJ, Oing C., Knudsen KE, Loeb S., Johnson DC, Reiter RE, Gillessen S., Van der Kwast T., Bristow RG Rak prostaty. Nat. Rev. Dis. Primers. 2021;7:9. doi: 10.1038/s41572-020-00243-0

[4] Siegel R.L., Miller K.D., Jemal A. Cancer statistics, 2018. CA Cancer J. Clin. 2018;68:7–30. doi: 10.3322/caac.21442

[5] Bergh R.C.V.D., Roemeling S., Roobol M.J., Aus G., Hugosson J., Rannikko A.S., Tammela T.L., Bangma C.H., Schröder F.H. Outcomes of Men with Screen-Detected Prostate Cancer Eligible for Active Surveillance Who Were Managed Expectantly. Eur. Urol. 2009;55:1–8. doi: 10.1016/j.eururo.2008.09.007

[6] Luzzago S., Suardi N., Dell'Oglio P., Cardone G., Gandaglia G., Esposito A., De Cobelli F., Cristel G., Kinzikeeva E., Freschi M., et al. Multiparametric MRI represents an added value but not a substitute of follow-up biopsies in patients on active surveillance for low-risk prostate cancer. Eur. Urol. Suppl. 2017;16:e1395–e1396. doi: 10.1016/S1569-9056(17)30854-0

[7] Canadian Cancer Society. Survival statistics for prostate cancer [Internet]. Toronto (ON): The Society; 2016

[8] Wasim S, Lee SY, Kim J. Complexities of Prostate Cancer. Int J Mol Sci. 2022 Nov 17;23(22):14257. doi: 10.3390/ijms232214257. PMID: 36430730; PMCID: PMC9696501

[9] Cancer Genome Atlas Research Network Molecular Taxonomy of Primary Prostate Cancer. Cell. 2015;163:1011–1025. doi: 10.1016/j.cell.2015.10.025

[10] Robinson D., Van Allen EM, Wu YM, Schultz N., Lonigro RJ, Mosquera JM, Montgomery B., Taplin ME, Pritchard CC, Attard G. et al. Integrated clinical genomics of advanced prostate cancer. Cell. 2015;162:454. doi: 10.1016/j.cell.2015.06.053

[11] Sekhoacha M, Riet K, Motloung P, Gumenku L, Adegoke A, Mashele S. Prostate Cancer Review: Genetics, Diagnosis, Treatment Options, and Alternative Approaches. Molecules. 2022 Sep 5;27(17):5730. doi: 10.3390/molecules27175730

[12] Crawford ED, Higano CS, Shore ND, Hussain M, Petrylak DP Treatment of patients with metastatic castration-resistant prostate cancer: a comprehensive review of available therapies. J. Urol. 2015;194:1537–1547. doi: 10.1016/j.juro.2015.06.106

[13] Jain KK Personalized medicine in cancer treatment: from drug development to clinical practice. Expert opinion. Pharmacother. 2005;6:1463–1476. doi: 10.1517/14656566.6.9.1463

[14] Kipriyanov EA, Karnaukh PA, Vazhenin IA, Vazhenin AV Radical prostatectomy and robotic radiosurgery as treatment options for localized prostate cancer. Sib. J.Oncol. 2020;19:50–56. doi: 10.21294/1814-4861-2020-19-1-50-56

[15] Mouraviev V., Polascik TJ Update on cryotherapy for prostate cancer in 2006. Curr. Opinion. Urol. 2006;16:152–156. doi: 10.1097/01.mou.0000193393.54598.9f

[16] Potosky AL, Legler J, Albertsen PC, Stanford JL, Gilliland FD, Hamilton AS, Eley JW, Stephenson RA, Harlan LC Health outcomes after prostatectomy or radiotherapy for prostate cancer: results from the Prostate Cancer Outcomes Study. JNCI J. Natl. Cancer Inst. 2000;92:1582–1592. doi: 10.1093/jnci/92.19.1582

[17] Mellman I., Coukos G., Dranoff G. Cancer immunotherapy comes of age. Nature. 2011;480:480–489. doi: 10.1038/nature10673

[18] Agrawal V., Ma X., Hu J.C., Barbieri C.E., Nagar H. Trends in Diagnosis and Disparities in Initial Management of High-Risk Prostate Cancer in the US. JAMA Netw. Open. 2020;3:e2014674. doi: 10.1001/jamanetworkopen.2020.14674

[19] Ngu JC, Tsang CB, Koh DC. The da Vinci Xi: a review of its capabilities, versatility, and potential role in robotic colorectal surgery. Robot Surg. 2017;4:77–85

[20] Intuitive Surgical Inc. Intuitive Annual Report 2019. Intuitive Surgical, Inc.; 2019. Accessed February 8, 2021

[21] Health Quality Ontario. Robotic Surgical System for Radical Prostatectomy: A Health Technology Assessment. Ont Health Technol Assess Ser. 2017 Jul 7;17(11):1-172. PMID: 28744334; PMCID: PMC5515322.

[22] Moschovas MC, Seetharam Bhat KR, Onol FF, Rogers T, Ogaya-Pinies G, Roof S, Patel VR. Single-port technique evolution and current practice in urologic procedures. Asian J Urol. 2021 Jan;8(1):100-104. doi: 10.1016/j.ajur.2020.05.003.

[23] Li CC, Chien TM, Lee MR, Lee HY, Ke HL, Wen SC, Chou YH, Wu WJ. Extraperitoneal Robotic Laparo-Endoscopic Single-Site Plus1-Port Radical Prostatectomy Using the da Vinci Single-Site Platform. J Clin Med. 2021 Apr 8;10(8):1563. doi: 10.3390/jcm10081563

[24] Kwang Hyun Kim, Hyun Kyu Ahn, Myong Kim, Hana Yoon,
Technique and perioperative outcomes of single-port robotic surgery using the da Vinci SP platform in urology, Asian Journal of Surgery, Volume 46, Issue 1,2023, Pages 472-477,
ISSN 1015-9584, doi.org/10.1016/j.asjsur.2022.05.128

[25] Moschovas MC, Brady I, Noel J, Zeinab MA, Kaviani A, Kaouk J, Crivellaro S, Joseph J, Mottrie A, Patel V. Contemporary techniques of da Vinci SP radical prostatectomy: multicentric collaboration and expert opinion. Int Braz J Urol. 2022 Jul-Aug;48(4):696-705.doi: 10.1590/S1677-5538.IBJU.2022.99.16

[26] Stephenson AJ, Scardino PT, Eastham JA et al. Preoperative nomogram predicting the 10-year probability of prostate cancer recurrence after radical prostatectomy. J Natl Cancer Inst 2006;98(10):715-717

[27] Xu J, Dailey RK, Eggly S, Neale AV, Schwartz KL. Men's perspectives on selecting their prostate cancer treatment. J Natl Med Assoc. 2011; 103(6):468–78

[28] Rojo MA, Martinez-Salamanca JI, Maestro MA, Galarza IS, Rodriguez JC. Impact of cosmetic result on selection of surgical treatment in patients with localized prostate cancer. JSLS. 2014 Oct-Dec;18(4):e2014.00024

[29] Novara G, Ficarra V, Mocellin S *et al.* Systematic review and meta-analysis of studies reporting oncologic outcome after robot-assisted radical prostatectomy. *Eur. Urol.* 62(3),382–404 (2012)

[30] Ficarra V, Novara G, Artibani W *et al.* Retropubic, laparoscopic, and robot-assisted radical prostatectomy: a systematic review and cumulative analysis of comparative studies. *Eur. Urol.* 55(5),1037–1063 (2009)

[31] Hou W, Wang B, Zhou L, Li L, Li C, Yuan P, Ouyang W, Yao H, Huang J, Yao K, Wang L. Single-site multiport vs. conventional multiport robot-assisted radical prostatectomy: A propensity score matching comparative study. Front Surg. 2022 Sep 28;9:960605. doi: 10.3389/fsurg.2022.960605

[32] Coughlin GD, Yaxley JW, Chambers SK, Occhipinti S, Samaratunga H, Zajdlewicz L, et al. Robot-assisted laparoscopic prostatectomy versus open radical retropubic prostatectomy: 24-month outcomes from a randomised controlled study. Lancet Oncol. (2018) 19(8):1051–60. 10.1016/S1470-2045(18)30357-7

[33] Jones Rabun, Dobbs W. Ryan, Halgrimson R. Whitney, Vigneswaran T. Hari, Madueke Ikenna, Wilson Jessica, Abern R. Michael, Crivellaro Simone; Single port robotic radical prostatectomy with the da Vinci SP platform: a step by step approach; Jun 2020 (Vol. 27, Issue 3, Pages(10263 - 10269). PMID: 32544051