

Laparoscopic pelvic lymph node dissection in the management of penile cancer: how to do it

Linfadenectomia pélvica laparoscópica no tratamento do câncer de pênis: como realizar

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ABSTRACT

There is a greater incidence of penis cancer in the underdeveloped countries. The lymph nodes are the principal site of metastasis. Patients with lymph nodes involvement undergo lymphadenectomy in most of cases. The laparoscopic access for the lymph node dissection is an attempt to minimize the surgical trauma without compromising the oncologic safety/completeness. There is no consensus regarding the timing and extent of the lymph node dissection in the penile cancer. **Objectives:** 1) Review the indications in the literature for laparoscopic pelvic lymphadenectomy in the comprehensive treatment of penile cancer, and 2) describe the surgical technique of lymphadenectomy using the laparoscopic approach demonstrating the possibility of preserving the radical quality of the surgery with a minimally invasive approach. **Discussion:** Because of pelvic lymphadenectomy in the treatment of cancer of the penis is performed in a isolated way, i.e. not associated with resection of the bladder or prostate, this surgery has several technical peculiarities. Laparoscopic pelvic lymphadenectomy permit replication of the open technique with the advantages of a minimally invasive procedure, making it an alternative for the treatment of penile cancer. **Conclusion:** The laparoscopic approach for the realization of pelvic lymphadenectomy has been shown to be feasible. There is a need to answer several questions about the treatment of penile cancer based on studies with a good level of evidence.

Key words: Penile cancer. Lymphadenectomy. Laparoscopy.

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INTRODUCTION

There is a high incidence of penile cancer in many developing countries. Twenty to thirty percent of patients with squamous cell carcinoma of the penis and inguinal lymph node involvement have in pelvic lymph nodes metastases.¹ Imaging methods to define the lymph node staging have low sensitivity and specificity; thus in many patients pelvic lymphadenectomy is performed to assess the presence of nodal metastatic disease.¹

In 1932, Godard and Kaliopoulus reported the first case of pelvic lymphadenectomy performed in conjunction with cystectomy. Since then, pelvic lymphadenectomy has become indicated in various genitourinary tract tumors. The presence of lymph node metastases almost always implies important therapeutic decisions. Patients with cancer of the

penis and local lymph node involvement should undergo regional (pelvic) lymph node dissection. How extensive and radical the surgery should be are, however, controversial.

The laparoscopic approach for performing pelvic lymphadenectomy – as an attempt to minimize surgical trauma without compromising the oncological radicality – was first described in 1991 by Schuessler, in the treatment of prostate cancer. Despite the existence in the literature of large series of pelvic lymphadenectomy in patients with bladder cancer and prostate cancer, there still are few reports of laparoscopic pelvic lymphadenectomy in the treatment of cancer of the penis. Surgery for patients with penile cancer has particularities that deserve to be described.

Because the survival of patients with pelvic lymph node involvement is limited, there are authors who have questioned its indication.² Some reports,

however, indicate a therapeutic potential approaching 20%, especially in young patients, who are more likely to have micrometastases.³ Furthermore, in selected cases, pelvic lymphadenectomy may be indicated in the staging of cancer of the penis before inguinal lymphadenectomy.³

The principal objectives of this paper are to describe the surgical technique of lymphadenectomy using the laparoscopic approach and to demonstrate the feasibility of preserving the radicalness of the surgery with a minimally invasive approach. We also review the literature regarding the indications for laparoscopic pelvic lymphadenectomy as complete surgical treatment of cancer of the penis.

SURGICAL TECHNIQUE

As in bladder and urethral cancer, extended pelvic lymph node dissection is indicated in cases of penile cancer.⁴ Unlike the standard or modified pelvic lymphadenectomy, which removes only the obturator and hypogastric lymph nodes, extended lymphadenectomy also removes the lymph nodes of the common and external iliac chains. The limits of dissection are identical to those already established in open surgery: starting from the common iliac vessels, they are the genitofemoral nerve laterally, the inguinal ring distally, and the obturator fossa and hypogastric vessels inferiorly. The dissection is always initiated on the side with the greater likelihood of lymph node involvement.^{5,6}

1 – Positioning of the surgical team and equipment

The surgeon is positioned behind the patient's head and the first assistant to surgeon's right. The video equipment is placed at the end of the surgical table opposite the surgeon.

2 – Positioning of the patient and trocars

The patient, after induction of general anesthesia and Foley catheter placement, is positioned supine with arms close to the body in Trendelenburg. Five trocars are placed in an inverted "V" pattern. They include a 10mm supraumbilical optic trocar, two 10mm trocars located on the right and left margins of the rectus abdominis muscle, and two 5mm trocars placed 2 cm medial to the right and left anterior superior iliac spines. In the literature there are variations in the positioning of the surgical team and of the trocars (Figure 1).

3 – Identification of anatomic landmarks

The medial umbilical ligament, iliac vessels, internal inguinal rings, vas deferens, and spermatic cords are identified. Traction can be applied to each testicle to facilitate identification of the spermatic cord where it enters the internal inguinal ring (Figure 2).

4 – Opening the peritoneum and dissection of the external iliac artery and vein

Begin the incision of the parietal peritoneum in the region of the internal inguinal ring. The opening of the peritoneum is extended cranially along the white line of Toldt above the psoas muscle to where the ureter intersects the common iliac veins. The small branches of the common iliac vessels that feed the psoas muscle should be ligated. After opening the peritoneum, the tissue over the psoas muscle is



Figure 1 - Trocar Placement.

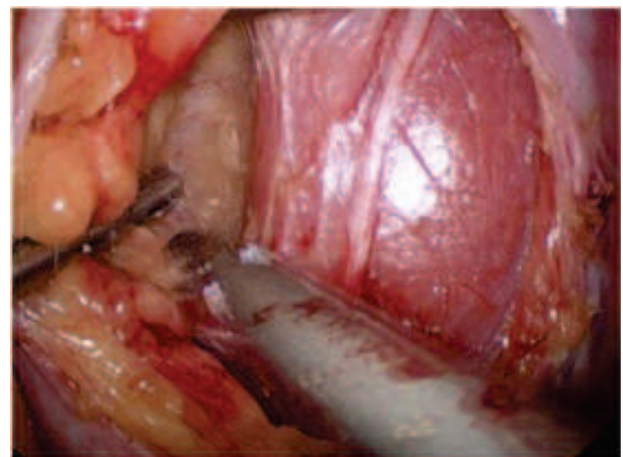


Figure 2 - Psoas muscle, genitofemoral nerve, and spermatic cord.

dissected medially to the genitofemoral nerve and the spermatic cord up to the external iliac vessels, which can be easily identified by the pulsation of the artery. Proceed with blunt dissection of the tissue overlying the external iliac vessels. Medial traction on these vessels exposes the lymph nodes located beneath them. The dissection continues, carefully, medially to the external iliac vein over the pelvic muscles until identification of the obturator nerve. The sectioned tissues should be ligated in order to prevent lymphocele formation (Figure 3).

5 – Dissection of the ureter and the internal iliac artery

The cranial limit of the dissection is the common iliac artery. Continuing the dissection from the bifurcation of this artery, the ureter is identified as it crosses over the artery. Once isolated, the ureter can be displaced medially or anteriorly with the aid of forceps handled by the second assistant in order to decrease the chance of inadvertent injury. Initiate the dissection over the internal iliac artery, where one identifies the obliterated umbilical artery and the bladder branches (Figures 4 and 5).

6 – Dissection of the external iliac vein to the Cooper ligament and isolation of the vas deferens

The dissection of the external iliac vein proceeds caudally toward the pubic bone. During dissection, the obturator vein that accompanies the corresponding nerve, can be identified. Next to the pubic bone one often encounters the accessory obturator vein, with which one must be careful to avoid bleeding. During the opening of the peritoneum toward the pubic bone, one identifies the vas deferens; it should be preserved or ligated in accordance with the patient's intention or not to preserve fertility. Next, the external iliac vein is dissected cephalically to the point where the internal iliac vein is identified (Figures 6 and 11).

7 – Dissection of the obturator nerve

The posterior limit of the dissection is the obturator nerve and the internal iliac vessels. The dissection of the nerve from Cooper's ligament should be done parallel to it, keeping it in view. The obturator nerve should be identified before performing clipping or sectioning of the lymph node tissue, thus preventing its accidental injury. Blunt dissection almost always



Figure 3 - Dissection of the external iliac artery to the point where it bifurcates.

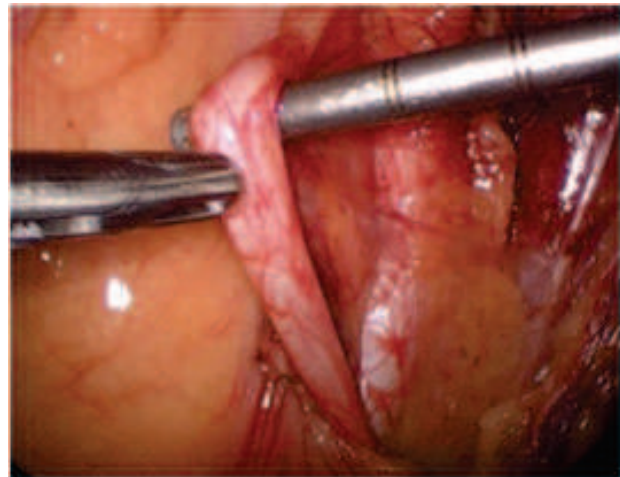


Figure 4 - Identification of the ureter.

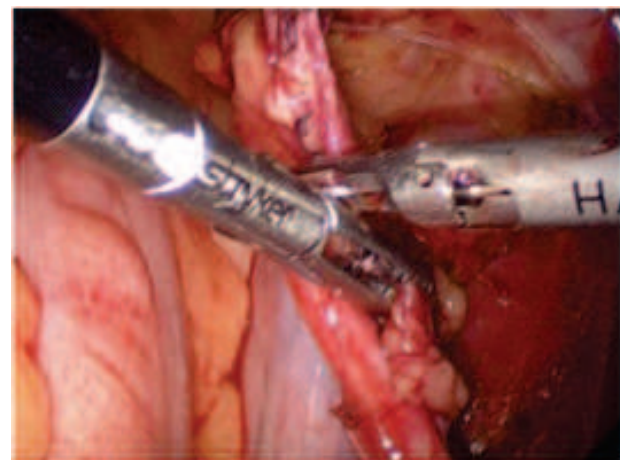


Figure 5 - Folding the ureter.

achieves the release of the nerve, but occasionally ligation and sectioning of the obturator veins may be necessary. The lymphatic tissue is freed from the

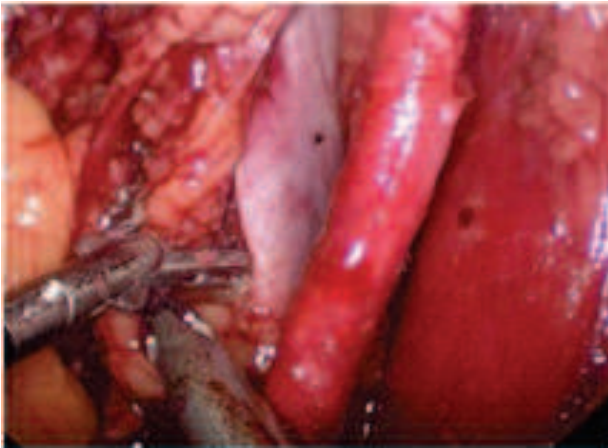


Figure 6 - Dissection of the external iliac vein.

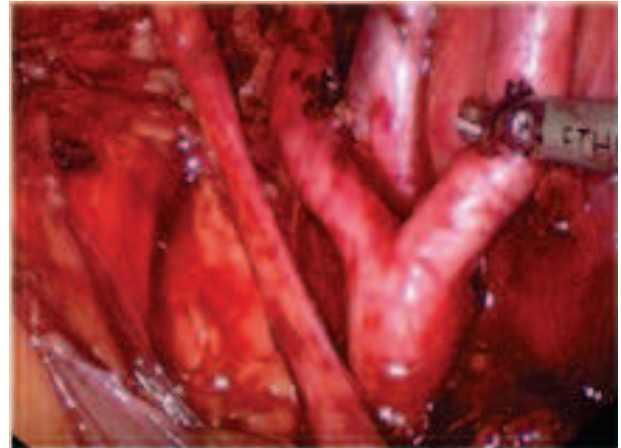


Figure 9 - Dissection of the Common and Internal Iliac Arteries.

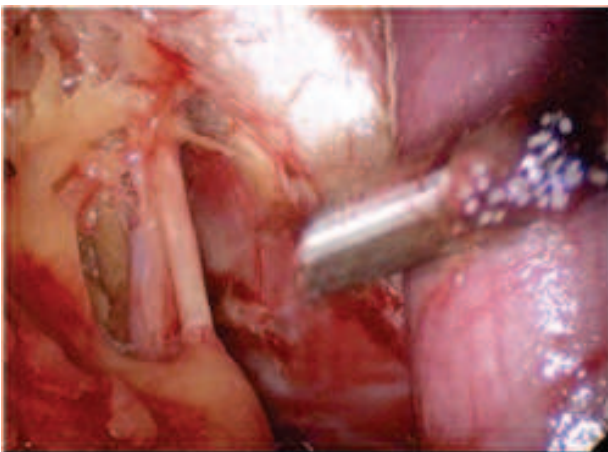


Figure 7 - Identification of the obturator artery and nerve.

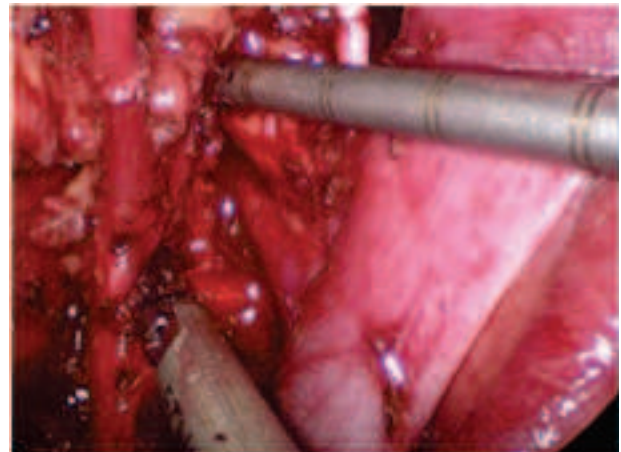


Figure 10 - Dissection of the Internal Iliac Vein.

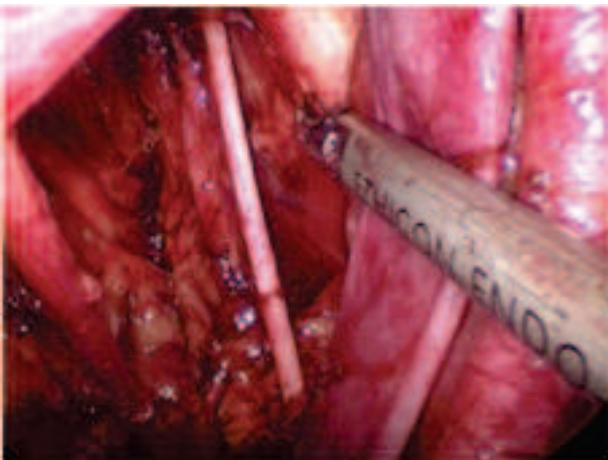


Figure 8 - Emptying the obturator fossa.



Figure 11 - Preservation of the deferens.

obturator nerve up to the point where the nerve passes behind the iliac vein. During this dissection electrocautery should be avoided; it can provoke nerve

stimulation triggering a brusque adduction of the lower extremity, which can cause a vascular injury (Figures 7, 8, 9, 10, 11, 12).

8 – Contralateral lymphadenectomy

After complete lymphadenectomy of the side considered most suspicious, contralateral lymph node dissection is performed using the same technique (Figure 13).

9 – Bagging and withdrawal of the surgical specimen

The lymphatic tissue is removed through the 10 mm portal in the umbilical region after being properly bagged within the cavity, thus preventing the seeding of tumor cells in the port (Figure 15).

10 – Drain placement and closing of ports

At the end of procedure, the abdominal pressure is lowered to 5 mmHg and is hemostasis is carefully reviewed. A full inspection of the pelvic structures is performed to visualize/identify a possible injury of viscera or vessels. A Drain is positioned in the pelvic cavity and the aponeuroses of the 10 mm ports are closed (Figure 14).

DISCUSSION

It is generally accepted that patients with malignant neoplasms of the penis and lymph node metastases should undergo surgery, but the timing and extent of lymphadenectomy remain controversial. Various strategies have been proposed. Some centers recommend pelvic lymphadenectomy followed by inguinal lymphadenectomy if there is no involvement of pelvic lymph nodes in the frozen sections.⁸

The philosophy that justifies this strategy is based on the prognosis of patients with pelvic



Figure 12 - Right lymphadenectomy (Final aspect).

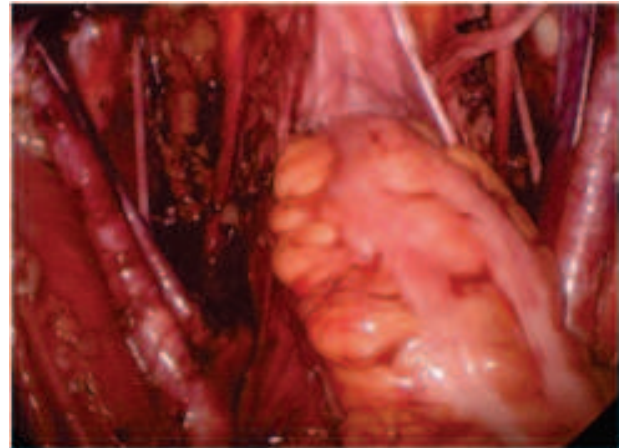


Figure 13 - Bilateral lymphadenectomy (Final aspect).



Figure 14 - Final aspect of the surgery.



Figure 15 - Surgical specimen.

metastases regardless of treatment. This fact, as evidenced in the large pelvic metastasis, cannot be applied to cases of microscopic metastases, where survival rates of 17% to 54% have been reported.^{7,8}

Because of this therapeutic potential, surgery should try to achieve the complete removal of lymph nodes that drain the pelvis. Partial pelvic lymph node dissection ipsilateral to the side of involvement of the penile tumor is also controversial.

The chance of involvement of pelvic lymph nodes is associated with the number of inguinal lymph nodes affected. Patients with one affected inguinal lymph node without involvement of the lymph nodes closest to the surgical specimen have a low chance of pelvic lymph node involvement. When two or more inguinal lymph nodes are affected, the probability of pelvic lymph node involvement increases. Other features of the inguinal lymph nodes such as the presence of extranodal extension, the ratio of positive lymph nodes to the number dissected, and p53 expression, also seem to have an ability to predict pelvic involvement.⁹

Preoperative lymph node staging is accomplished through imaging studies. Computed tomography (CT) is the test most often performed for this purpose. The accuracy of this test has been evaluated in several studies of genitourinary tract cancers, especially bladder and prostate.

In the case of penile cancer, the number of studies is greater for the evaluation of inguinal lymph nodes. The sensitivity of CT for detecting metastases in pelvic lymph nodes is 48%, but the specificity ranges from 83% to 100%.¹⁰ Approximately 40% of cases are under-staged and 5% are over-staged.¹⁰ CT guided needle biopsies of the pelvic lymph nodes is an option for detecting nodal metastases, however, it has not been scientifically evaluated.

Patients with macroscopic pelvic lymphadenopathy due to metastases are not theoretically curable with surgery alone. The role of lymphadenectomy is being questioned and the role of adjuvant and neoadjuvant treatments is being evaluated.

There still are no prospective randomized trials to assess the effect of adjuvant treatment in increasing the survival of patients with risk factors associated with a poor prognosis. Nevertheless, based on the experience treating squamous cell carcinoma in other regions of the body, some groups have used adjuvant radiotherapy for patients with two or more metastases or extracapsular disease in inguinal lymph nodes and the presence of pelvic metastases. The main purpose of this adjuvant approach is to improve the local control.¹¹

Neoadjuvant and adjuvant chemotherapy after lymphadenectomy is beneficial in patients with head

and neck and gynecological tumors and seems to have some role in the presence of metastases in the pelvic lymph nodes in cancer of the penis. However, its benefit relative to radiotherapy alone is unclear.

The technique of laparoscopic pelvic lymphadenectomy, including the extended technique has been widely described, mostly associated with radical cystectomy and prostatectomy. When performed in the treatment of penile cancer, there are several important technical details, because the lymph node dissection is carried out with the ureters, bladder and the vas deferens in the surgical field. The ureter can be displaced medially or cranially with the help of forceps by the second assistant or displaced cranially during exposure of the common and internal iliac vessels. Care also needs to be taken with the vas deferens, as some patients, especially the young, want to preserve their fertility.

Recent reports have shown a complication rate of 15% in transperitoneal laparoscopic lymphadenectomies. Laparoscopic training and experience have reduced complication rates. On the other hand, articles that compare the complications of laparoscopic lymphadenectomy with open surgery use series of patients with prostate or bladder cancer, in which pelvic lymphadenectomy was performed in conjunction with a different surgical procedure, and not in the isolated way as with cancer of the penis.

Potential complications of pelvic lymphadenectomy include bleeding, injury to the bladder and ureter, bowel perforation, deep vein thrombosis, pulmonary embolism, intestinal obstruction, urinary retention, hypercarbia, obturator nerve injury, wound infection, lymphocele and lymphedema.

Most of these complications can be avoided with a careful surgical technique and immediate repair of lesions identified during surgery. The use of electrocautery should be minimized to avoid inadvertent and unrecognized injuries.

Conversion to open surgery is most commonly required when a vascular injury occurs, especially involving the iliac vein. Small injuries to the iliac artery and vein can often be addressed during via the laparoscopic access. Obviously, there can be no doubt about the quality of the repair.¹²

CONCLUSION

The laparoscopic approach for pelvic lymphadenectomy has been shown to be feasible.

Cancer of the penis is one of the tumors with the fewest studies and publications. Although the technique is not new and many leading services have established protocols, there are no randomized studies and only a small number of case reports describing the use of laparoscopic access in the

treatment of penile cancer. There is a need to answer several questions about the treatment of penile cancer based on studies with a good level of evidence. The rarity of this disease, especially in developed countries, however, makes such studies difficult to organize.

RESUMO

O câncer de pênis apresenta alta incidência nos países subdesenvolvidos. O principal sítio de metástases são os linfonodos. Os pacientes com acometimento linfonodal são, na maioria das vezes, submetidos à linfadenectomia. O acesso laparoscópico para realização da dissecação linfonodal é uma tentativa de minimizar o trauma cirúrgico sem comprometer a radicalidade oncológica. Não há um consenso quanto ao momento da realização e a extensão da dissecação linfonodal no câncer de pênis. **Objetivos:** 1) Revisar na literatura as indicações da linfadenectomia pélvica laparoscópica no tratamento complementar do câncer de pênis, e 2) descrever a técnica cirúrgica da linfadenectomia utilizando o acesso laparoscópico, demonstrando a possibilidade de manter a radicalidade cirúrgica com um acesso minimamente invasivo. **Discussão:** Pelo fato da linfadenectomia pélvica no tratamento do câncer de pênis ser realizada de forma isolada, ou seja, não associada a ressecção da bexiga ou da próstata, esta cirurgia apresenta particularidades técnicas. A linfadenectomia pélvica laparoscópica permite a reprodução da técnica aberta com as vantagens de um procedimento minimamente invasivo, tornando-se uma alternativa no tratamento do câncer de pênis. **Conclusão:** O acesso laparoscópico para a realização da linfadenectomia pélvica tem se mostrado factível. Existe a necessidade de se responder a várias perguntas sobre o tratamento do câncer de pênis baseadas em trabalhos com bom nível de evidência.

Palavras chave: Câncer de pênis. Linfadenectomia. Laparoscopia.

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