



## Single ilioinguinal access like an alternative to the Enneking and Dunham's utilitarian approach for internal hemipelvectomy

### Acceso ilioinguinal único como una alternativa al abordaje utilitario de Enneking y Dunham para hemipelvectomía interna

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#### Abstract

**Introduction:** Internal hemipelvectomy is an alternative in the treatment of pelvic tumors that is traditionally performed using the utilitarian approach described by Enneking and Dunham (1978), however, it involves potential skin suffering that tends to delay healing and consequently the start of adjuvant therapies in oncological patients. **Material and methods:** Retrospective and descriptive study related to the access used by the authors to perform internal hemipelvectomies in which the usual skin conflict zone of the utilitarian approach, is avoided. The surgical technique and the clinical results obtained through the surgical access detailed here, are described, as well as the feasibility of obtaining adequate resection margins. **Results:** 17 patients were included, 64.7% of whom presented some complication, but in only one case it could be attributed to the proposed ilioinguinal access as a possible facilitator to this unfavorable situation. The resection margins were clean in 16 patients (90.9%), while the positive case is still alive and without data of tumor activity 11 years after the procedure. **Discussion:** Hemipelvectomy involves high rates of complications. The proposed access eliminates one of the situations that could generate cutaneous morbidity that could delay possible adjuvant therapies. **Conclusions:** It is a complex procedure, safe in trained hands, potentially beneficial in the surgical recovery process, capable of not affecting the control of the disease, but which must be performed by specialized surgeons.

**Keywords:** Internal hemipelvectomy, utilitarian, approach, ilioinguinal access.

#### Resumen

**Introducción:** La hemipelvectomía interna es una alternativa en el tratamiento de tumores pélvicos que tradicionalmente se realiza mediante el abordaje utilitario descrito por Enneking y Dunham (1978); sin embargo, implica un potencial sufrimiento cutáneo que suele retrasar la cicatrización y consecuentemente el inicio de terapias adyuvantes en pacientes oncológicos. **Material y métodos:** Estudio retrospectivo y descriptivo relacionado al abordaje empleado por los autores para la realización de hemipelvectomías internas, por el cual se evita la zona habitual de conflicto cutáneo del abordaje utilitario. Se describen la técnica quirúrgica y los resultados clínicos obtenidos mediante el acceso quirúrgico aquí detallado, además de la factibilidad para obtener márgenes de resección adecuados. **Resultados:** Se incluyeron 17 pacientes, de los cuales, 64.7% presentaron alguna complicación, pero sólo en un caso podríamos atribuir el abordaje ilioinguinal propuesto como posible facilitador de dicha situación desfavorable. Los márgenes de resección fueron limpios en 16 pacientes (90.9%), mientras que el caso positivo continúa vivo y sin datos de actividad tumoral a 11 años del procedimiento. **Discusión:** La hemipelvectomía implica altos índices de complicaciones. El acceso propuesto elimina una de las situaciones que pudieran generar morbilidad cutánea que retrasara posibles terapias adyuvantes. **Conclusiones:** Se trata de un procedimiento complejo, seguro en manos entrenadas, potencialmente benéfico en el proceso de recuperación quirúrgica, capaz de no afectar el manejo de la enfermedad, pero que forzosamente deben realizarlo cirujanos especializados.

**Palabras clave:** Hemipelvectomía interna, utilitario, abordaje, acceso ilioinguinal.

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## Introduction

The treatment of pelvic tumors represents one of the greatest challenges within oncological orthopedics.<sup>1-4</sup> Before the 1970's most tumors in the pelvic zone were surgically treated with hindquarter amputation.<sup>5</sup> The primary tumors of this region are infrequent and the most commonly found diagnoses are chondrosarcoma, Ewing sarcoma and osteosarcoma. External hemipelvectomy (hindquarter amputation) is the one in which the affected limb is sacrificed from the sacroiliac joint, or failing that from the supraacetabular area; while the internal hemipelvectomy is the one in which a segment or the totality of the iliac bone is resected, but preserving the affected limb. Both types of hemipelvectomy are performed for primary bone tumors and soft tissue sarcomas, and occasionally due to metastatic lesions involving the pelvis.<sup>6</sup> In 1978 Enneking y Dunham,<sup>7</sup> described what is now known as utilitarian approach for internal hemipelvectomy. This approach has been widely used by the different surgical teams that treat this type of patients, however it implies the generation of an intersection point of the skin cuts when a «T» is formed, which usually becomes, as a result of cutaneous ischemia, in a conflict zone with morbidity during the healing process (*Figures 1 and 2*).<sup>8</sup> Pelvic neoplasms are characterized by late diagnosis and large tumor masses in an anatomically complex area, and with a tendency to form dead spaces after oncological resections. Reducing the incidence of complications is essential throughout the therapeutic process.

Internal hemipelvectomy has been firmly established as a reliable method of treatment for



**Figure 1:** Skin damage after internal hemipelvectomy performed using the utilitarian approach of Enneking and Dunham.



**Figure 2:** Healing process in skin coverage.

the vast majority of patients with primary localized tumors involving the pelvis.<sup>9</sup> In this type of procedure, any reconstruction option tends to increase the possibility of complications, hence the tendency of certain working groups towards non-reconstruction. The indication for limb salvage is the ability to obtain clean wide margins without compromising survival and function.<sup>5</sup>

## Material and methods

This is a descriptive and retrospective study in relation to hemipelvectomies performed in two High Specialty Medical Units belonging to the Northeast Medical Center, at the Mexican Institute of Social Security, and in the private practice of the authors. All patients undergoing to internal hemipelvectomy treated using a single ilioinguinal access, were included, which could be of different length based on the location of the neoplasm, and with the possibility of being extended, always avoiding the generation of intersection of cut lines forming a «T». The study period was from November 2005 to November 2021. The diagnoses that were found, although they didn't directly represent the objective of the study, were specified as a fundamental point in understanding the type of patients who undergo internal hemipelvectomy. The resections were classified based on those described by Enneking and Dunham,<sup>7</sup> and the complications modifying, the possibilities pointed out by Sánchez-Torres et al.<sup>10</sup> The resection margins, in the understanding that they could be compromised by an access with less freedom of surgical manipulation, were classified based on the Residual Tumor (R) Classification.<sup>11-14</sup>

Preoperative workup included medical history, clinical examination and routine blood tests. X ray, CT

and MRI scans of the pelvis were obtained in each case. Histologic diagnosis were done in every patient either core needle or open biopsy.

None of the patients considered in this study was reconstructed, and all the procedures had the participation of the Senior surgeon (S-TLJ).

### Surgical technique

Once anesthetized, monitored and invaded with vascular accesses and urinary catheter, the patient must be properly positioned. We suggest lateralizing the supine position in the upper abdominal and dorsal areas approximately 30 degrees, raising the side that will be operated, as well as flexing the horizontal line with hyperextension of the flank (kidney position) for a better exposure of the pelvic cavity and the retroperitoneum; in this way we can extend our cutting line in different proportions according to the planned resection, as well as mobilize the affected limb as necessary (Figure 3). We make our



Figure 3: Schematic representation for patient positioning for internal hemipelvectomy.

incisión following the iliac crest with the possibility for extension to the spine and/or continuing in the inguinal region to descend through the groove formed between the thigh and genitals; here is possible to continue distally in a straight line along the medial aspect of the thigh, or by continuing a spiral that facilitates the resection of the ischial area. The incision was carried down sharply through the skin and subcutaneous tissue using electrocautery for hemostasis. The access continues by transection of the flank and abdominal muscles separating them from the iliac crest, as well as the inguinal ligament and channel to access to retroperitoneum and the Retzius space, releasing the spermatic cord in men. Adequate visualization and identification of the iliac vessels, psoas muscle, ureter, lumbosacral plexus and bladder, is always important. The protection of the urethra is essential to open the pubic symphysis (The use of a Richardson retrator is of great help for the public exposure). If necessary, the femoral vessels can be dissected by extending our approach in the proximal thigh by forming and lateralizing the corresponding flap, thus being able to visualize the entire Scarpa triangle, and in the depth, the hip joint. With the distal extension of the approach we can access to the proximal thigh muscles and facilitate the management of the ischial area. The pelvic floor musculature is released from surgical specimen by mobilizing it. The required osteotomies, as well as the mobilization and the complete release of the surgical piece are possible by this route. The resection of a large intrapelvic mass does not make a difference in the care of vascular and visceral structures in

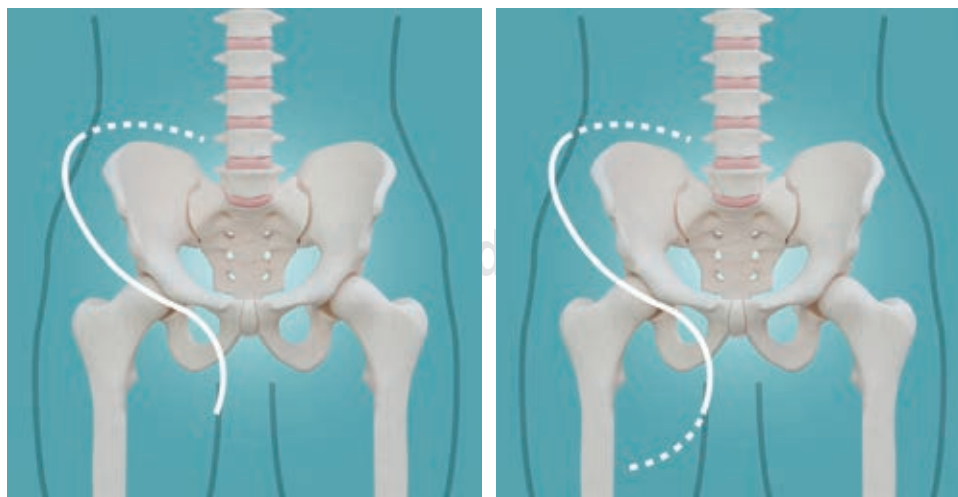


Figure 4:

Proposed surgical access for internal hemipelvectomy.

**Table 1:** The cases, ages, type of resection performed, resection margin obtained, and finally the existence and description on the complications presented, are listed.

Case	Diagnosis	Age	Resection (P)	Residual Tumor	Complications
1	OSA	12	III	R1	None
2	CSA	29	I	R0	Seroma
3	ASA	22	II + III	R0	Severe infection <sup>15</sup>
4	UPS	43	I + IIA + III	R0	Seroma
5	GCT	32	I + IIA + III + IV	R0	Vascular complication
6	STS	35	I + II + III	R0	Seroma
7	GCT	24	I + IV	R0	Severe infection
8	STS	30	III	R0	Hematoma
9	CSA	42	I + IIA + III	R0	None
10	UPS	49	IIA + III	R0	None
11	CSA	09	I + II + III	R0	None
12	CSA	25	I + II + IV	R0	Severe infection
13	CSA	62	I + IIA + III + III	R0	Seroma + skin damage
14	MET	56	I	R0	None
15	EWS	14	I + II + IV	R0	None
16	EWS	18	I + IIA + III	R0	Severe infection
17	CSA	62	I	R0	Severe infection

relation to the utilitarian approach described by Enneking and Dunham. The release of the surgical piece in the posterior area can be successfully carried out by the corresponding constricted flap on the buttock (*Figure 4*).

## Results

From November 2005 to November 2021 we performed 46 hemipelvectomies, from which 25 were external and 21 internal. Of the internal hemipelvectomies reported, 4 were eliminated due to the fact that in two cases the classic utilitarian approach of Enneking and Dunham was performed and in the other two cases the patients died in the first 24 hours during their stay in the intensive care unit as a result of an acute myocardial infarction ( $n = 1$ ), and hypovolemic shock ( $n = 1$ ). The ages of the 17 patients included in the present study ranged between 9 to 62 years, with an average of 33 and a median of 30 years old.

The number of cases per diagnosis were: 6 chondrosarcomas (CSA), 1 osteosarcomas (OSA), 2 undifferentiated pleomorphic sarcoma (UPS), 2 giant cell tumors of bone (GCT), 2 soft tissue sarcomas (STS), 2 Ewing sarcoma (EWS), 1 angiosarcoma (ASA), and 1 metastasis (MET). The type of resection in each case is detailed in *Table 1*.



**Figure 5:** Complete healing after an internal hemipelvectomy I + II + III.

Complications were observed in 64.7% of the cases ( $n = 11$ ), and the rest 35.3% remained free of them ( $n = 6$ ) (*Figure 5*).

Of all the patients with complications, 27.27% of them developed seromas ( $n = 3$ ), 9.09% presented seroma plus skin damage ( $n = 1$ ), 9.09% hematoma ( $n = 1$ ), 45.45% severe infectious process ( $n = 5$ ), and 9.09% presented thrombosis of the affected pelvic limb ( $n = 1$ ), which required taking the patient to an external hemipelvectomy 24 hours after the initial procedure. One of the complicated patients was one with a severe infectious process that had a history of

kidney transplantation, and consequently in treatment with immunosuppressants, in addition to having multiple allergies to antibiotics.<sup>15</sup> In the case of the patient who, in addition to a seroma presented skin damage, it should be emphasized that the resection was extended to the contralateral zone III, which is why it was pulled ( at the pubic symphysis level ) more than usual than during a complete internal hemipelvectomy. One of the cases that developed a severe infectious process was in a diabetic patient with metabolic control problems.

The resection margins were reported as R0 in 90.9% of the cases (n = 16) and an R1 in only one patient (9.1%). This patient is still alive and free of tumor activity.

## Discussion

The main objective in tumor surgery is the adequate resection of the lesion.<sup>16</sup> The standard approach for pelvic bone resections involves the utilitarian incision described by Enneking and Dunham, which is an extended ilioinguinal approach that frequently requires an additional perpendicular incision, which forms a «T». This requirement implies an area of cutaneous suffering that usually generates morbidity in the healing process that delay the recovery of the patients. This unfavorable situation usually impacts the rehabilitation and the start of adjuvant therapies in negative way. The access that we propose, reduces the possibility of complications derived from skin coverage.

Although it is true that surgical experience in pelvic resections is required, we believe that a surgical team related to this type of therapeutic challenges, can consider the accessibility to all the pelvic area using an access that eliminates the intersection of cut lines, and consequently reducing the morbidity generated.

Approaching a pelvic neoplasm through an access that can be posteriorly extended to the spine, which can be continued medially and distally to expose the pubis or the proximal thigh, that also allows us to adequately visualize vascular, nervous and visceral structures, in addition to management of the buttock and abdominal wall musculature, with the benefit of avoid the generation of a perpendicular incision which generates a morbidity zone (in procedures already characterized by a high incidence of complications), its becomes in a surgical access tool that is worth considering.

Limitations of the study include the following. First, the small number of patients, however we must

consider that these are very infrequent procedures. Second, we do not have a comparative group of patients traditionally approached. Lastly, we did not evaluate the negative impact on the continuity of treatments generated by the complications in our patients.

## Conclusions

Hemipelvectomy is the mainstay of treatment for pelvic tumors. Internal hemipelvectomy is an unusual surgical event that frequently is complicated in different ways mainly derived from the aggressive nature of the procedure, the prolonged duration of surgeries, the generation of dead spaces after resection (resulting in seromas, hematomas and abscesses), cutaneous suffering due to the spontaneous exposure for the drainage of collections or the weakening of the circulation of the flaps in the intersection zone of cut lines. Although intrapelvic collections are difficult to avoid after procedures of this nature, the rest of skin complications during healing are likely to be avoided or at least reduced by a single ilioinguinal approach. This type of approach, although more demanding, can be performed with acceptable success rates when are performed by surgical teams related with this variety of uncommon procedures.

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### **Conflict of interests**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.