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Resection of the Posterior Thigh Compartment and Modification of the Surgical Technique for Bulky Tumors

Jairo Bascetta, Luis Alemán, Héctor Malavé, Gregorio Orta, José Gómez

Hospital Del Ivss Uyapar, Venezuela.

Abstract: Objective: We present a 59-year-old male patient with a 6-month evolution lesion characterized by an increase in volume in the posterior region of the right thigh with expansive growth, pain of moderate intensity and limitation of gait. Clinical case: Magnetic resonance of the thigh that reports: "focal alteration within the thickness of the posterior superficial muscular plane, biceps femoris muscle short and long head, visible focal oval lesion, measuring approximately 10.44 cm × 7.3 cm with heterogeneous intensity, shows trabeculae, detritus and high intensity content". Drainage and biopsy report: malignant mesenchymal tumor. Tumor vascularization and suspected involvement of superficial branches in the deep femoral artery. With the improvement of the Malawer Sugarbaker surgical technique, the posterior septal tumor of the thigh was removed through a supine anteroposterior approach, vascular control, and cross surgical management of pathological anatomy. Adequate oncological resection with surgical result, evolution and satisfactory recovery. Conclusion: For large tumors that may or have been confirmed to have vascular involvement, modifying the classic technique of posterior thigh resection is a feasible and provable alternative method from a practical perspective, as it can better control tumor lesions during surgery. For large volume posterior chamber sarcoma with vascular involvement, it is recommended to adopt multidisciplinary management and utilize existing tools to personalize each clinical case.

Key words: sarcomas resection; posterior compartment; technical modification

1. Introduction

Soft tissue sarcomas are a heterogeneous group of tumors that can develop anywhere in the body and originate from embryonal mesodermal tissue. It is a rare disease, with an incidence of 2-3/100000 new cases per year. The age of maximum incidence is between 50 and 65 years old. These tumors can occur in any part of the body, but are more frequent in the extremities (50%-59%), trunk and retroperitoneum (40%), head and neck (10%) [1, 2]. They account for less than 1% of all malignant tumors in adults, and clinically present as a painless mass that is initially insidious, grows slowly, reaches significant size, or causes pain [3]. The thigh is the most frequent location of sarcomas in the lower extremity. The resection of this type of tumors requires disease-free margins and generates secondary defects that are not usually closed directly, or are obtained with tension [4]. The posterior compartment of the thigh is the least affected compartment for sarcomas to originate. Approximately 15-20% of soft tissue sarcomas of the thigh arise within the posterior thigh musculature [5]. We present a clinical case of posterior resection of sarcoma of the posterior compartment of the thigh

with modification of the surgical technique.

2. Clinical Case

A 59-year-old male from the local area developed the disease about 6 months ago, characterized by an increase in volume in the posterior part of the right thigh, accompanied by dilated growth, moderate pain, and gait limitation. This clinical condition will gradually worsen. He goes to a specialist who requests thigh MRI 02/02/18 which reports: "focal alteration within the thickness of the posterior superficial muscle plane, biceps femoris muscle, short and long head, visible oval focal lesion, measuring approximately 10.44 cm × 7.3 cm with heterogeneous intensity, showing trabeculae, detritus and high intensity content". The patient was sent to the operating room on February 23, 2018 with a diagnosis of: (1). The right calf biceps abdominis hematoma has fallen off. (2). Secondary compression of the right sciatic nerve periphery. Drainage was performed and a sample was taken for pathological anatomy. According to biopsy report Nº 155-18, the result is: malignant mesenchymal tumor. During the physical examination, his clinical condition was stable and his face was pale. No regional adenopathy was found. Cardiopulmonary: stable. Extremities: asymmetrical due to a tumor on the right thigh, with a 17 cm difference compared to the left thigh. Hypertrophic scars can be seen at the back of the right thigh. The tumor is 26 cm × 34 cm, with nutritional changes and peripheral venous hyperplasia. The circumference diameter of the right thigh is 59 cm, and the left thigh is 42 cm. There are discrete restrictions on walking. No distal edema and symmetrical pulses.

Figure 1. Patient in prone position, large tumor size.

Figure 2. Patient in supine decubitus, visualization of the lesion on the internal lateral aspect.

2.1 Paraclinical

(1). MRI of right thigh. LOE affects nearly one-third and middle one-third of the right thigh, while the posterior part affects the deep plane and extends to the well-defined, lobulated, and heterogeneous subcutaneous cellular tissue. It measures approximately 21 cm × 12 cm × 11 cm. As the volume increases and the signal strength changes. Invasive and sarcomatous lesions (Figure 3).

(2). Chest and abdominal pelvic CT: normal study.

(3). Lower limb angiography. There is evidence to suggest vascularization of the deep femoral artery tumor, which is an undefined clivus area and closely related to the superficial femoral artery. There is no evidence of blood flow obstruction (Figure 4).

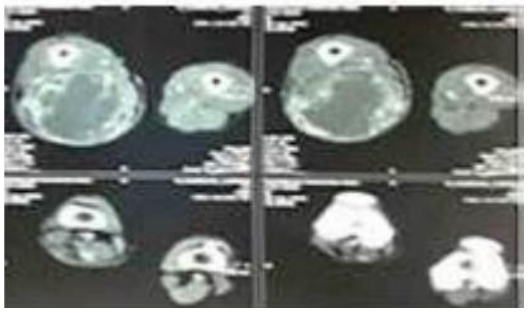

Figure 3. MRI of right thigh, LOE affecting proximal one-third and middle one-third of thigh.

Figure 4. Lower limb angiography, lateral view, and poorly defined clivus and vascularized areas of deep femoral artery tumors.

A work plan was discussed with a multidisciplinary team formed by oncological surgery, cardiovascular surgery, anesthesiology and pathological anatomy, and a decision was made: conductive epidural anesthesia with catheter to prolong anesthetic time, anterior approach in supine position, vascular control of femoral vessels with deep femoral artery ligation, tumor resection with superficial femoral artery resection according to intraoperative findings of infiltration and reconstruction with PTFE vascular prosthesis 6 mm × 30 cm and trans-operative biopsy of the lesion edges.

The patient was taken to the operating room and found a tumor 30 cm × 20 cm in size, with highly developed blood vessels and ulcers. The hypertrophic scar from the previous surgery was 10 cm. There were no femoral blood vessels and no infiltration of the sciatic nerve. A nodular lesion of 1.5 cm in the popliteal fossa (Figure 5).

Figure 5. Large tumor 30 cm × 20 cm, highly vascularized, ulcerated, with hypertrophic scar of previous surgery of 10 cm. No infiltration of femoral vessels and sciatic nerve. Nodular lesions of 1.5 cm in popliteal fossa.

2.2 Description of the technique: modified approach

(1). Patient in supine decubitus, asepsis and antisepsis protocol and surgical fields.

(2). Right inguinal longitudinal incision, dissection until identification of the femoral vascular bundle with ligation of the deep femoral artery (Figure 6).

(3). Subsequent positioning of the lower extremity with leg flexion at 60°, thigh with external rotation and slight abduction.

(4). Longitudinal incision in the internal posterolateral face, with fasciocutaneous flap confection and trans-operative biopsy of skin edges, reported by pathological anatomy as negative for malignancy (Figure 7).

(5). Section of muscle tissue, respecting 1 cm of healthy tissue margin, with dissection and preservation of the gracilis and sartorius muscle. With Hunter's canal approach after identification of vascular structures until reaching the bone plane (Figure 8 to 10).

(6). Identification and preservation of the sciatic nerve.

(7). Longitudinal incision in the external posterolateral face, with fasciocutaneous flap confection and tran-operative biopsy of skin edges, reported by pathological anatomy as negative for malignancy (Figure 9 A and B).

(8). A section of healthy tissue about 1 cm laterally of the quadriceps femoris was taken to the bone plane and the sciatic nerve was identified (Figure 11).

(9). For the progress of the intervention, the limb is placed in elevation.

(10). Section of proximal and distal insertion tendons at the level of the ischial tuberosity and popliteal fossa (Figure 12 A and B).

(11). Transoperative biopsies were performed on the margins, proximal, distal, deep, medial, and lateral parts of the tumor. The anatomic and pathological reports showed that the malignant tumor was negative. The deep ones are the narrowest.

(12). Advancement of fascio-cutaneous flaps of the internal and external anterolateral face for defect closure, after placement of 2 branches of ¼ inch suction drainage (Figure 15).

(13). Synthesis by planes. Vicryl 2-0, separate stitches in subcutaneous. Prolene 2-0 fasciocutaneous reinforcement and nylon 2-0 in skin "U" stitches.

(14). Dressings and compressive bandage.

Figure 6. The right inguinal longitudinal incision was dissected until the femoral vascular bundle was discovered and the deep femoral artery was ligated.

Figure 7. Make a longitudinal incision on the inner and posterior face, prepare the fascia flap, and perform a biopsy on the skin edge after surgery. The pathological anatomy report shows that the tumor is negative.

Figure 8. Muscle tissue section, respecting 1 cm of healthy tissue margin, with dissection and preservation of the Gracilis and Sartorius muscle.

Figure 9. A and B. A longitudinal incision was made on the posterior lateral side of the face, and a biopsy of the fascia flap and surgical skin edge was performed. The report was negative for malignant tumors.

Figure 10. The method of Hunter tube before identifying the vascular structure of the bone plane.

Figure 11. The muscle tissue section respects the 1 cm edge of healthy tissue, passes through the outside of the quadriceps femoris muscle to the bone plane, and recognizes the sciatic nerve.

Figure 12. A and B. Section of proximal and distal insertion tendons at the level of the ischial tuberosity and popliteal fossa.

Figure 13. Surgical bed after tumor resection. Sciatic nerve (A) and M. Gracilis (B) can be seen.

Figure 14. Tumor lesion.

Figure 15. Advancement of internal and external anterolateral fascio-cutaneous flaps for defect closure, after placement of 2 branches of ¼" suction drainage.

Figure 16. Appearance of the defect closure in the immediate postoperative period 24 h after surgery. The patient is progressing smoothly, with early mobilization of the limbs, anti edema measures, and outpatient management. Walking is supported for 7 days. Biopsy results nº 2465-18 (Dr. Gregorio Orta).

2.3 Histological diagnosis

Biopsy of soft tissue tumor of the posterior aspect of the right thigh: high grade pleomorphic undifferentiated sarcoma; measuring 30 cm × 20 cm × 16 cm, grade 3 (undifferentiated, with a necrosis rate of less than 50%, and over 20 mitotic cells in 10 high-power fieldss) of the French grading system, with no tumor lesions at the lateral, deep, distal, and proximal surgical resection edges, and the three lymph nodes that are closest to 0.3 cm deep and metastasize to the distal end (around the tumor).

Skin biopsy. Inner side: length 23 cm, width 2.5 cm, outer side: length 30 cm, width 1.1 cm: subdermal fibrosis, without evidence of tumor infiltration.

3. Discussion

Soft tissue sarcoma (STC) is a group of rare tumors that are widespread and heterogeneous, characterized by frequent and complex multidisciplinary treatment. Although significant progress has been made in understanding the pathology and molecular biology of this disease in recent years, the development of clinical treatment is more cautious. In practice, mainly due to the rarity and complexity of this disease, results are not always optimal [6].

Treatment has changed from ablative procedures to more conservative surgical treatments. Preservative surgery associated or not with adjuvant therapy is the standard treatment and amputation will only be considered when it is not possible to achieve negative margins for malignancy or functional reconstruction of the limb [4, 6].

Depending on the location and stage of the sarcoma, surgery may be used to remove the cancer and some of the surrounding tissue. In the past, many sarcomas of the extremities were treated by amputation. Today, amputation is rarely necessary. Instead, most patients can undergo limb-sparing surgery [7].

According to Malawer M et al. [5], the classic surgical techniques for posterior thigh septal tumors (Figure 17) are summarized as follows: (1). The incision extends from the curved sitting bone towards the midline, down to the thigh, back to the level of the popliteal fossa, and then passes through the S-shaped popliteal fossa (from inside to outside). Then it enters the head of the fibula. This incision can expose the popliteal fossa, sciatic nerve, medial and lateral sciatic tibia, and the origin of the sciatic bone. (2). Excision involves releasing the origin of the sciatic tibialis muscle, and exploring the posterior gluteal area during the removal of the proximal tumor and the ischiorectal space to ensure that there is no tumor extension. (3). If the tumor is located at the distal end of the posterior thigh, a popliteal space scan is required. The

popliteal artery and vein, as well as the sciatic nerve, were scanned and contracted. (4). The muscles involved are released from the inside of the knee or fibula, and the entire muscle group can be excised from the thick line [5].

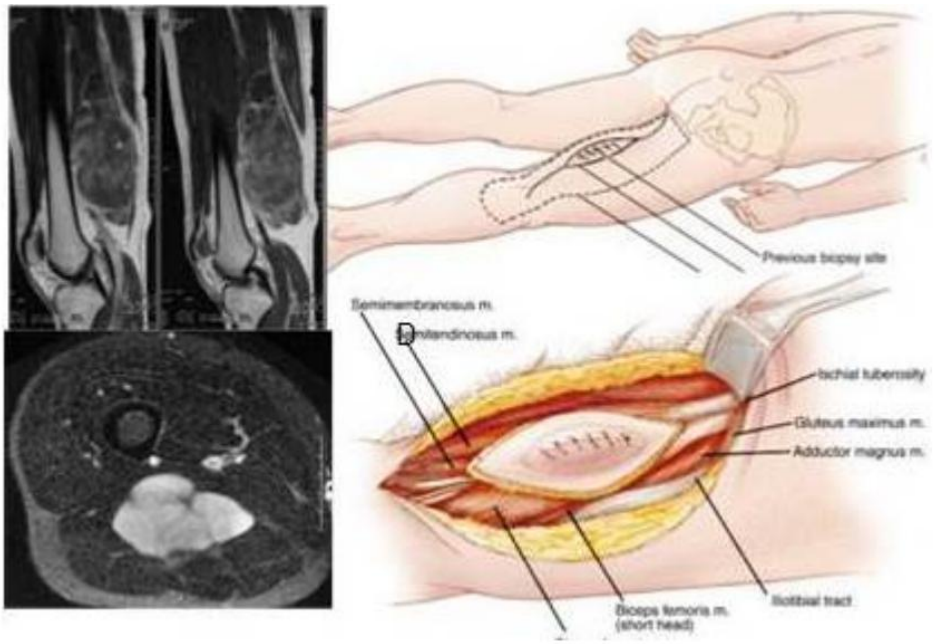

Figure 17. A and B, C and D. Representation of lesions in the posterior compartment of the thigh susceptible to classic compartmental resection. C and D Classic approach to resection of the posterior compartment of the thigh [5].

Regarding the initial management of the proposed clinical cases, it is inevitable to mention that from the perspective of oncology or diagnostic methods, it is not the most suitable in the era of minimally invasive surgery. Percutaneous ecological guided biopsy is the best choice to avoid surgical wounds, surgical and recovery times, tumor growth, and delayed final behavior.

The choice of surgical treatment for this lesion depends on the size of the tumor, although it can still provide protective behavior. Given that the characteristics described by the tumor are suspected of vascular infiltration and the risk of surgical injury and bleeding, they asked the surgical team to consider:

(1). Reduce blood flow by ligating the deep femoral artery as the first step in the scarpa triangular inguinal approach.

(2). Positioning in a supine position to avoid vascular traction when detecting infiltrating femoral vessels, as well as surgical treatments that require segmented resection and reconstruction.

The modification of this technology enables us to preserve tumor standards for tumor resection under appropriate vascular control, although it does not require resection and reconstruction of the superficial femoral artery as people imagine, if it allows us to have good exposure when necessary.

Multi disciplinary management, using all available tools to personalize each clinical case, enables us to provide the best treatment outcomes. In our era, it is necessary to strive to ensure more preservation and less slaughter without affecting tumor outcomes. Therefore, any modifications or contributions are useful.

The modification of the classic thigh posterior behavior resection technique for large tumors that may or have been proven to have vascular involvement is a feasible and practical alternative, as it can better control tumor damage during the surgical process.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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