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CASE REPORT
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Intermuscular Lipoma in Dogs

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ABSTRACT

***Background*:** Lipoma is a benign tumor composed of mature adipose tissue commonly found in subcutaneous tissues. However, eventually, lipomas may be located between the muscle fasciae being classified as intermuscular lipomas. Complete surgical resection of the tumor mass is indicated as a treatment of affected patients.This report describes five cases of intermuscular lipoma in dogs, due to the scarcity of data in the literature and lipoma relative importance in the clinical and surgical routine.

***Case*:** Five dogs were presented with a history of a large volume in the limbs with progressive growth, suggesting the presence of neoplasia. The first step was to conduct anamnesis, when the owner reported slow growth, absence of pain, limping and licking of site. No other change was observed upon physical examination. Complete blood count (CBC) as well as liver assessment (FA) and renal (creatinine) were performed in all patients, and the results showed no changes. Fine needle aspiration cytology (FNAC) was performed and showed cells from adipose tissue, followed by histopathological examination of the lesions. Histopathological examination after incisional biopsy of the tumors showed malignancy-free tissue, composed of adipocytes without atypia, interspersed with fibrovascular stroma, confirming the lipoma diagnosis. Intermuscular lipomas were diagnosed in five dogs with a history of a large volume in the limbs with progressive growth; all of them underwent bloc resection of the tumors. In all cases, the intermuscular lipomatous tumors were well-circumscribed and easily isolated from the tissues.

***Discussion*:** Although lipomas are relatively common in older dogs, especially in the subcutaneous tissue, intermuscular subtype is rare in veterinary medicine, which justifies the report of these cases. Intermuscular lipomas account for only 0.3% of the occurrences in human medicine. Morphologically described as tumors of slow and progressive evolution, typically reaching sizes up to 2 cm in humans, the particular cases of tumor masses greater than 5 cm are called giant lipomas. The slow development of intermuscular lipomas has also been described in domestic animals by, thus corroborating the clinical history in this work. The intermuscular septum is considered as the origin of intermuscular lipoma, with subsequent development of the adipose tissue between adjacent muscle bundles, thus, resulting usually in well-circumscribed mass of easy surgical divulsion. The morphological characteristics of the resected lipomas, as well as the simple surgical technique corroborate descriptions in the literature. Intermuscular lipomas consist of a challenging diagnosis despite attracting little attention from surgeons. The possibility of the mass being malignant, such as liposarcoma, should also be considered since the clinical symptoms consist of swelling of the deep soft tissues. The diagnosis for all these patients was obtained by histopathological examination, since the simple observation of the clinical findings alone does not support the tumor diagnosis. Lipoma and liposarcoma should be differentiated by cytological and histopathological evaluations of the neoplasia, whereas infiltrative lipomas can be diagnosed based on diagnostic imaging methods or even on the findings during surgery. In this report, specifically, the findings during surgery contributed to the differentiation between infiltrative and intermuscular lipoma, while for malignancy rating all patients underwent cytological and histopathological evaluations as indicated in the literature. In conclusion, this study demonstrated that complete resection of intermuscular lipoma proved to be an effective treatment to cure the patients.

Keywords: benign neoplasm, surgery, resection of intermuscular, canine.

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INTRODUCTION

Lipoma is a benign neoplasm of soft tissues of mesenchymal origin, composed of mature adipose tissue, which affects approximately 16% of dogs [3,4,8]. Elderly and obese dogs are more predisposed to develop lipomas, especially females, because of their physiological tendency to accumulate greater amounts of adipose tissue [3,4].

Intermuscular lipomas are more frequently observed in the pelvic limbs, especially in the caudal portion of the femoral region between the semimembranosus and semitendinosus muscles [1]. There are high numbers of cases in the forelimbs; however, the literature does not describe any preference for any of the thoracic limb muscles, being found equally distributed between the pectoral muscles and the shoulder muscles [1].

The recommended treatment is complete surgical excision of the intermuscular lipoma, since it is effective, presents low rates of recurrence and has good prognosis [1,4]. Good surgical planning is crucial to therapeutic success, since local recurrence of tumor masses are associated with incomplete excision techniques [2,7]. Postoperative complications are rare and limited to the formation of seroma, wound infection and nerve injury, depending on lipoma location [1,4].

This report describes five cases of intermuscular lipoma in dogs, due to the scarcity of data in the literature and lipoma relative importance in the clinical and surgical routine.

CASES

Five dogs were presented with a history of a large volume in the limbs with progressive growth, suggesting the presence of neoplasia. The first step was to conduct anamnesis, when the owner reported slow growth, absence of pain, limping and licking of site. No other change was observed upon physical examination. Complete blood count (CBC) as well as liver assessment (FA) and renal (creatinine) were performed in all patients, and the results showed no changes.

Fine needle aspiration cytology (FNAC) was performed and showed cells from adipose tissue, followed by histopathological examination of the lesions. Histopathological examination after incisional biopsy of the tumors showed malignancy-free tissue, composed of adipocytes without atypia, interspersed with fibrovascular stroma, confirming the lipoma diagnosis.

Radiographic examination showed no evidence of pulmonary metastasis while the ultrasound examination detected no changes suggestive of abdominal metastasis. The diagnosis and test results indicated that the treatment for all five patients was surgery, with wide resection of the tumor mass, respecting the safety margins.

Anesthetic protocol consisted of pre-anesthesia with intramuscular (IM) administration of tramadol chloride (Tramal®)[1] [4 mg/kg] and chlorpromazine chloride (Amplictil®)[2] [0.4 mg/kg], and 15 min later, anesthesia was induced intravenously (IV) with propofol (Diprivan®)[3] [5 mg/kg]. This was followed by tracheal intubation of all patients to maintain anesthesia by inhalation with isoflurane (Isoflurine®)[4] in 100% oxygen. More specifically, when the tumor was located in the pelvic limb, epidural anesthesia was performed via lumbosacral puncture with a combination of lidocaine (Xylestesin®)[4] [2.5 mg/kg], bupivacaine (Neocaína®)[4] [0.5 mg/kg] and morphine chloride (Dimorf®)[4] [0.1 mg/kg].

After induction, the animals were placed on the surgical table and antisepsis was performed with 70% ethyl alcohol (Ethanol®)[5] and 20% Digluconate solution Chlorhexidine (Chlorhexidine®)[6]. In all patients, the skin incision was performed around the tumor followed by divulsion adjacent to the capsule covering the neoplastic mass. After complete tumor resection, the adjacent muscles were sutured with standard sultan stitches while the subcutaneous tissues with standard intradermal polyglecaprone 3-0 wire, followed by skin suture with 3-0 nylon in simple interrupted pattern. The excised material of all patients was sent for histopathological evaluation.

The first case, a 6-year-old, male Pinscher, weighing 4 kg, was presented for examination of a sharp volume increase in the left proximal tibia, which had been progressing for the last 2 years. On physical examination, it was observed that the volume increase had firm consistency, irregular shape and measured 7.2 by 3.6 cm, and no tenderness on palpation. The owner was warned about the possibility of limb amputation during the surgery due to tumor location, and failure to achieve resection with tumor-free margins. However, the characteristics of the neoplasia and the fact that the tumor mass was well-defined by the capsule, complete resection of the lipoma was performed without requiring amputation of the affected limb.

The surgical technique consisted of assessing the femur laterally. After blunt dissection of the subcutaneous tissue, the lipoma was located between the fasciae of the gastrocnemius (lateral head), lateral digital flexor and peroneus longus. Sequentially, the mass was removed completely. A genicular axial pattern flap was used to close the defect left after the removal of the lipoma. The flap pedicle was delimited by the patella and tibial tuberosity. From the pedicle edge, two parallel incisions were made laterally to the thigh and a third incision was made opposite to the pedicle at the base of the femur greater trochanter. The skin flap was carefully raised and immediately transferred to the cutaneous defect, preserving the genicular branch of the saphenous artery. The edges of skin and flap were sutured with interrupted simple stitches using náilon (Nylon)[7] 3-0. The donor area was sutured with reduced dead space using polyglecaprone (Caprofyl)[8] 2-0 in standard intradermal suture followed by skin suture in simple interrupted pattern with nylon 3-0 (Figure 1). As a precautionary measure, a Penrose drain was placed to prevent seroma accumulation, if this were to be formed.

Figure 1. The 6-year-old pinscher in the immediate postoperative period after the removal of an intermuscular lipoma using the genicular axial pattern flap technique.

The second patient, a 6-year-old, male Labrador, weighing 59 kg was attended with a history of swelling in the right femur and the cranial-lateral region of the right chest, progressive for the last 5 months. On physical examination, marked swelling and patient's difficulty to move around due to swelling in the right pelvic limb were observed. There was local pain on both sites. The patient had been previously treated with anti-inflammatory, without satisfactory clinical response. The skin incision was made in the caudal region of the thigh on the transition of the semimembranosus and semitendinosus muscles. After blunt dissection of the subcutaneous tissue, the lipoma was located between the fasciae of the semimembranosus and semitendinosus muscles. After careful handling and divulsion of adjacent tissues, the sciatic nerve was isolated followed by tumor resection. Sequentially, the mass of approximately 15 cm in diameter was removed en bloc. The thoracic region node of 8 cm in diameter was also removed following the same methodology described above.

The third case, a 7-year-old, female mixed-breed dog, weighing 8 kg, was referred with history of a recurrent lesion in the forelimb, a mass in the lateroventral portion measuring approximately 7 cm long, 4 cm wide and 3 cm thick. At the beginning of the dissection, it was observed that the tumor was intermuscular, located between the carpal flexor and the superficial digital flexor muscles and progressing to the ulna. A brachial axial pattern flap was used to close defect after tumor resection was performed. The graft skin was obtained from two cranial-lateral incisions, one on the spine of the scapula and the other caudal and parallel to the first incision, forming an approximately 5-cm wide rectangle. The flap was carefully raised preserving the subdermal plexus and the brachial artery. Sequentially, the flap was rotated to the most distal portion of the defect and sutured with simple interrupted pattern stitches using 3-0 nylon7 thread. The flap donor site was sutured reducing the dead space with intradermal continuous suture using polyglecaprone8 2-0 in simple continuous pattern, which was followed by skin suture with nylon7 3-0 in simple interrupted pattern.

The fourth patient, a 14-year-old, female Labrador, weighing 32 kg, was seen (was presented) with swelling in the caudal portion of the hip that progressed toward the medial limb and caused discomfort when

walking. The mass measured approximately 10 cm long, 8 cm wide and 7 cm thick. During intraoperative, as observed on physical examination, the tumor was located between the semitendinosus and semimembranosus muscles, progressing toward the wing of the ischium. After blunt divulsion, the entire neoplastic contents were removed en bloc.

The fifth patient, an 8-year-old, female Pit Bull, weighing 28 kg, was referred due to swelling in the caudal portion of the hip, measuring approximately 12 cm long, 9 cm wide and 7 cm thick. The swelling progressed inwards the pelvic limb and caused discomfort when walking. Following the skin incision and dissection of the soft tissues, the tumor mass was located between the semitendinosus and semimembranosus muscles and advancing toward the femur. All neoplastic content was removed en bloc (Figures 2 & 5).

The home postoperative care recommended for all patients was resting, local dressing, using the Elizabethan collar. The drugs prescribed were Cloridrate of Ranitidine (Label®)[9] [2.2 mg/kg, bid, 10 days], Cephalexin (Keforal®)[1] [30 mg/kg, bid, 10 days], Meloxicam (Meloxicam®)[1] [0.1 mg/kg, sid, 3 days], Cloridate of Tramadol (Tramal®)[4] [2 mg/kg, tid, 7 days] and Dipyrone (Novalgina®)[1] [25 mg/kg, tid, 7 days] for analgesia and prophylaxis in case of infection of the surgical site, and to fight tissue inflammation.

The postoperative evaluations showed good healing progress of the surgical wound and good general condition of the patient, as well. The patients, on average, were discharged from the hospital on the 10th postoperative day, after removal of the skin sutures. Specifically, the female mixed breed dog of case 3 was released from the hospital after 30 days only, due to complications of the flap, which progressed to necrosis to about 50% of the graft. In this case, we opted for wound healing by secondary intention.

Figure 2. The 8-year-old Pit Bull preoperatively. Mass in the caudal portion of the right hindlimb, progressing towards the medial face.

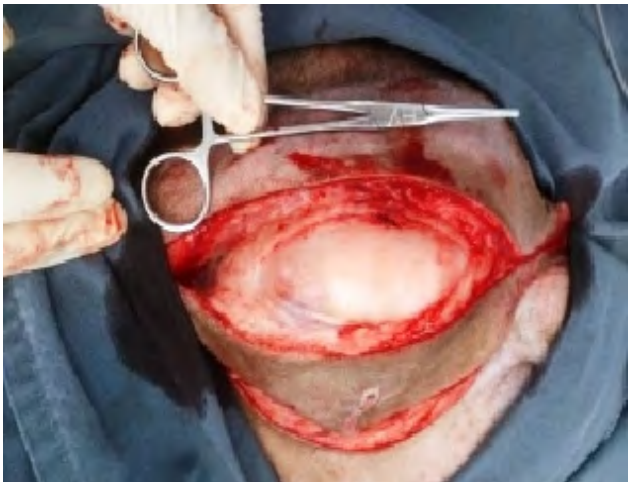

Figure 3. During surgery. Incision adjacent to the lesion and before resection of the tumor, located between the semimembranosus and semitendinosus muscles.

Figure 4. Intermuscular lipoma approximately 12 cm long, 9 cm wide and 7 cm thick, after complete resection.

Figure 5. Immediate postoperative. Hindlimb after suture approximation of the muscle and skin suture with nylon 3-0 in simple interrupted pattern.

DISCUSSION

Although lipomas are relatively common in older dogs, especially in the subcutaneous tissue, intermuscular subtype is rare in veterinary medicine [5], which justifies the report of these cases. Intermuscular lipomas account for only 0.3% of the occurrences in human medicine [9].

Morphologically described as tumors of slow and progressive evolution, typically reaching sizes up to 2 cm in humans, the particular cases of tumor masses greater than 5 cm are called giant lipomas [3]. The slow development of intermuscular lipomas has also been described in domestic animals by Liptak and Forrest [5], thus corroborating the clinical history in this work.

The intermuscular septum is considered as the origin of intermuscular lipoma, with subsequent development of the adipose tissue between adjacent muscle bundles, thus, resulting usually in well-circumscribed mass of easy surgical divulsion [6]. The morphological characteristics of the resected lipomas, as well as the simple surgical technique corroborate descriptions in the literature [6].

The pathophysiology of the occurrence of giant lipomas remains unknown. Among the theories proposed, most authors argue that micro-traumas lead to rupture of the fibrous septa and connection between the skin and deep fascia, which then prevents migration of fat, permitting the proliferation of adipose tissue. Other theories, including metabolic disorder, endocrine and genetic factors have also been proposed as the cause of the uncontrolled growth of adipose tissue [3].

Intermuscular lipomas consist of a challenging diagnosis despite attracting little attention from surgeons. The possibility of the mass being malignant, such as liposarcoma, should also be considered since the clinical symptoms consist of swelling of the deep soft tissues [3]. The diagnosis for all these patients was obtained by histopathological examination, since the simple observation of the clinical findings alone does not support the tumor diagnosis.

Furthermore, it is important to differentiate intramuscular and intermuscular lipomas, in order to plan an appropriate surgical treatment. These two benign tumor types have remarkably different relapse rates and aggressiveness degrees [7]. Infiltrative lipomas are uncommon, and although benign, can invade muscle fibers, nerve bundles and eventually the bones. These tumors are composed of well-differentiated adipocytes without evidence of anaplasia, so they are indistinguishable from adipose tissue [5]. In contrast, the intermuscular lipomas of this report did not invade adjacent tissues, appearing as well-circumscribed encapsulated masses, even though the histopathological description is similar to the infiltrative intramuscular lipomas.

Lipoma and liposarcoma should be differentiated by cytological and histopathological evaluations of the neoplasia, whereas infiltrative lipomas can be diagnosed based on diagnostic imaging methods or even on the findings during surgery [1,7]. In this report, specifically, the findings during surgery contributed to the differentiation between infiltrative and intermuscular lipoma, while for malignancy rating all patients underwent cytological and histopathological evaluations as indicated in the literature [1,5].

A biopsy may be needed before definitive treatment as stated by Tallini and Tan [9], due to the difficulty in diagnosing the intermuscular lipoma by imaging diagnostic methods. Although images of benign lesions are often pathognomonic, with regular margins, tissue of density (tissue density) similar or identical to subcutaneous fat, and the presence of a capsule, in some cases lipoma can present different characteristics [9]. Irregular margins may occur as a consequence of lipoma growth nature, mimicking malignant masses [9].

Although ultrasonography is the initial diagnosis method of choice, in view of its accessibility and low cost, it does not provide a definitive diagnosis [2,6]. Thus, more sensitive techniques, such as tomography and magnetic resonance imaging should be considered, to assess more accurately the nature of the neoplasm [6]. According to Nishida et al. [7], tomography is better than MRI to differentiate tumor malignancy, while MRI is indicated for anatomic delineation of the tumor. In this study, a definitive diagnosis was obtained from histopathological examination of tumor masses by incisional biopsy, while radiography and ultrasonography were auxiliary procedures used to search for visceral metastases.

Deep lipomas are often asymptomatic, and for this reason they are diagnosed at more advanced stages by the veterinarian; however, many clinical signs may occur due to the local neurovascular compression [2,4]. Surgical treatment is indicated for such neoplasias due to their gradual growth and the fact that they

cause harm to the patient [5]. Among the five cases reported, locomotor difficulties secondary to pressure from nervous structures were present in three cases. Additionally, large tumor masses with progressive evolution were reported for all patients, thus corroborating the findings of the literature [2,4] and justifying the surgical treatment.

Postoperative complications associated with surgery include anesthetic risks, delayed surgical wound healing, seroma buildup, and nerve damage, depending on the location and depth of the lipoma [4]. In general, the prognosis is excellent, since intermuscular lipomas are easily removed by a simple surgical technique [1].

The ease of the surgical technique for resecting the tumor was observed in all cases; however, the additional use of reconstructive technique was required in two patients in order to close the skin gap left after tumor removal. The postoperative complications were restricted to those cases in which skin flaps were used. Seroma buildup and partial flap necrosis were observed. The other patients presented good healing of the surgical wound and were discharged from the hospital, on average, 10 days after surgery.

As indicated by Lahrach *et al*. [3], the therapy chosen to treat the intermuscular lipomas in this work was complete surgical resection of the tumor mass, through the blunt dissection of the muscle fascia adjacent to the neoplasia [1].

In all patients, the intermuscular lipomatous tumors were well circumscribed easily isolated from the surrounding tissues. Nishida et al. [7], also reported easy implementation of the surgical technique. Macroscopically, lipomas are described as well-circumscribed yellow or orange masses of greasy consistency, surrounded by a thin capsule. Microscopically, adipocytes are the same size or slightly bigger compared to normal cells [2].

A careful analysis of the cases in this report shows that intermuscular lipoma in the femoral region, specifically between the fascia of the semimembranosus and semitendinosus muscles, was markedly more frequent. A previous study [1] reported that intermuscular lipomas in pelvic limbs occur between these same muscle groups in about 80% of patients. In contrast, the intermuscular lipomas in the forelimb are more distributed among the muscle groups that make it, with 43% in the pectoral muscles and another 43% in the scapular muscles [1]. The reason for the highest occurrence of intermuscular lipomas among thigh muscles is still unknown; however, it is speculated that anatomical differences between the tissues surrounding the hip joint and scapulohumeral joints may play a significant role in the development of tumors [1].

Intermuscular lipomas are rare tumors in veterinary. Accurate diagnosis and meticulous surgical planning are essential to the success of therapy in order to prevent recurrence and patient functional deficits. Complete tumor resection was the treatment of choice in this study due to effectiveness and simple technical implementation.

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