

Limb and Trunk Lipoblastoma: Local Recurrence and Complications after Marginal Resection. A Multicenter Study

Patricio Manzone,^{*} J. Javier Masquijo,^{**} Marta Salom Taverner,[#] Silvana Fiscina,^{##} Sergio F. Innocenti^{##}

^{*}Spinal Pathology Unit, Pediatric Orthopedics and Traumatology Service, Pediatric Hospital "Dr. Avelino Castelan", Resistencia, Chaco, Argentina

^{**}Department of Orthopedics and Traumatology, Sanatorio Allende, Córdoba, Argentina

[#]Unit of Orthopedic Surgery and Child Traumatology, Hospital Universitari i Politecnic La Fe, Valencia, Spain

^{##}Orthopedics and Traumatology Service, Pediatric Hospital "Prof. Dr. Juan P. Garrahan", Autonomous City of Buenos Aires, Argentina

ABSTRACT

Objectives: Lipoblastoma is a rare benign neoplasm that resembles white fat and can occur as a localized (lipoblastoma) or diffuse (lipoblastomatosis) tumor. Due to its rarity, the literature is mostly limited to case reports. The purpose of this study was to determine the local recurrence rate and complications after marginal resection of lipoblastomas located in the extremities or the back. **Materials and Methods:** We performed a multicenter retrospective review of the records of pediatric patients who had undergone surgical excision of lipoblastomas at 4 tertiary care institutions from 2008 to 2018. We recorded the demographic data, diagnostic method, the volume of the lesion, type of biopsy, complications, recurrence, and the need for additional procedures. **Results:** Throughout the study, 17 patients met the inclusion criteria for evaluation. The average patient age was 3.9 years, and 65% were male. The most common locations included thighs (N 9), low back region (N 2), and buttocks (N 2). The mean preoperative mass volume was 305.5 cm³ (range: 10.2 cm³ - 1745.8 cm³). The mean duration of follow-up was 2.8 years (range: 8 months to 5.6 years). One patient experienced recurrence (5.9%). One patient had a retracted skin scarring in the gluteal area. **Conclusion:** Marginal surgical resection of lipoblastomas located in the back or extremities showed a low recurrence rate at 2.8 years of follow-up and minimal complications.

Keywords: Lipoblastoma; lipoblastomatosis; children; marginal resection.

Level of Evidence: IV

Lipoblastoma de extremidades y tronco: recurrencia local y complicaciones después de la resección marginal. Estudio multicéntrico

RESUMEN

Objetivo: El lipoblastoma es una neoplasia benigna poco común que puede presentarse como un tumor localizado o difuso (lipoblastomatosis). Debido a su rareza, se han publicado, en su mayoría, solo reportes de casos. El objetivo de este estudio fue determinar la tasa de recurrencia local y las complicaciones después de la resección marginal de lipoblastomas ubicados en extremidades y tronco. **Materiales y Métodos:** Se realizó una revisión retrospectiva multicéntrica de los registros de pacientes pediátricos sometidos a extirpación quirúrgica de lipoblastomas en cuatro instituciones, entre 2008 y 2018. Se registraron las siguientes variables: datos demográficos, método diagnóstico, volumen de la lesión, tipo de biopsia, complicaciones, recurrencia y necesidad de procedimientos adicionales. **Resultados:** Durante el período de estudio, 17 pacientes cumplieron los criterios de inclusión para la evaluación. La media de la edad fue de 3.9 años y el 65% eran varones. Las ubicaciones más frecuentes fueron: muslos (n = 9), columna lumbar (n = 2) y glúteos (n = 2). El volumen de masa preoperatorio medio fue de 305,5 cm³ (rango: 10,2-1745,8). La duración media del seguimiento fue de 2.8 años (rango: de 8 meses a 5.6 años). Hubo una recurrencia (5,9%) y una cicatriz retraída en el área glútea como complicación. Ninguno requirió una nueva intervención. **Conclusión:** La resección quirúrgica marginal de lipoblastomas localizados en el dorso o las extremidades genera una baja tasa de recurrencia a los 2.8 años de seguimiento y mínimas complicaciones.

Palabras clave: Lipoblastoma; lipoblastomatosis; niños; resección marginal.

Nivel de Evidencia: IV

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INTRODUCTION

Lipoblastoma is a benign lesion of immature fat cells (originating from embryonic white fat), composed of various states of adipocytes, which almost exclusively affects the pediatric population. This rare tumor that occurs in infancy and childhood comprises less than 1% of pediatric neoplasms. It typically appears before the age of 3 years, but can manifest as late as adolescence. Less than 10% of all pediatric soft tissue tumors are adipose and only 5-30% of them are lipoblastomas. It is usually more common in males,¹⁻³ and it often manifests as an asymptomatic lobulated soft tissue mass and can present as a localized (lipoblastoma) or diffuse (lipoblastomatosis) tumor.

Although it is a benign lesion, its treatment can be very difficult due to its extensions in different facial planes, especially in the lipoblastomatosis variety. The treatment of choice is complete surgical extirpation.

Because of its rarity, for the most part, only case reports have been published. The objective of this study was to determine the rate of local recurrence and complications after marginal resection in lesions of the back and extremities.

MATERIALS AND METHODS

A multicenter, retrospective cohort study was conducted with a review of all the clinical-surgical and imaging data of pediatric patients (between 0 and 16 years) with a diagnosis of lipoblastoma confirmed by histology, between January 2008 and December 2018, in four tertiary hospitals in two countries (Spain and Argentina). The follow-up period was defined by the date of surgery until the last clinical control. The following variables were retrospectively evaluated: demographic data, reason for consultation, diagnostic method, approximate size and volume of the lesion, type of biopsy, pathological diagnosis, staging, type of surgical treatment, complications, recurrence, the requirement for additional procedures, and functional disorders or sequelae. The volume of the lesion was calculated in the preoperative imaging studies by assimilating the mass, in each case, to a determined geometric body (cylinder, sphere, etc.), measuring the diameters, radii, and corresponding lengths in the images and obtaining then the corresponding volume by mathematical formulation; this volume was compared with that of the extracted piece.

The data of the different variables were collected in an Excel spreadsheet. Statistical analysis was descriptive with means for continuous variables, such as age, and percentages for categorical variables, such as gender. The findings were contrasted with the data from the literature review of the disease.

RESULTS

Seventeen patients (11 boys [65%] and 6 girls) with lipoblastomas located in the lower limb ($n = 15$) and trunk ($n = 2$) were evaluated. The average age was 3 years and 2 months (range: 11 months to 10 years and 2 months). Almost two-thirds of the patients (59%) had been referred from other subsidiary hospitals of the study Sites. The topographic location is detailed in [Figure 1](#).

The reasons for consultation were: tumor (82%), limb asymmetry (12%), understood as the difference in volume between both limbs with tumor or without tumor, and both conditions (6%).

Sixteen of the 17 patients underwent magnetic resonance imaging (MRI); 16, with soft tissue ultrasound, and 6 also with conventional radiographs. The average volume of the tumor mass was 305.52 cm³ (range: (10.2-1745.8. In most cases, the biopsy was open ([Figure 2](#)).

The anatomopathological study revealed 15 lipoblastomas of the localized variety and two of the diffuse variety (diffuse lipoblastoma/lipoblastomatosis).

Only one patient (who had had a biopsy taken at another Center) had undergone surgery at another Site. The remaining 16 had been fully treated from the beginning in the Sites that were included in this study.

All underwent intracompartmental surgical excision with marginal resection. Nine received an elastic compression bandage postoperatively, six had no special indication, and two were prescribed relative rest for an average of three weeks.

The mean postoperative follow-up was 2 years and 10 months (range: 8 months to 5½ years), but 12 of the 17 had reached or exceeded two years of follow-up. The mean age at follow-up was 6 years and 5 months (range: 1 year and 10 months to 12 years and 5 months). At the time of the study cutoff, all had been clinically evaluated; 16 also with soft tissue ultrasound and one with MRI.

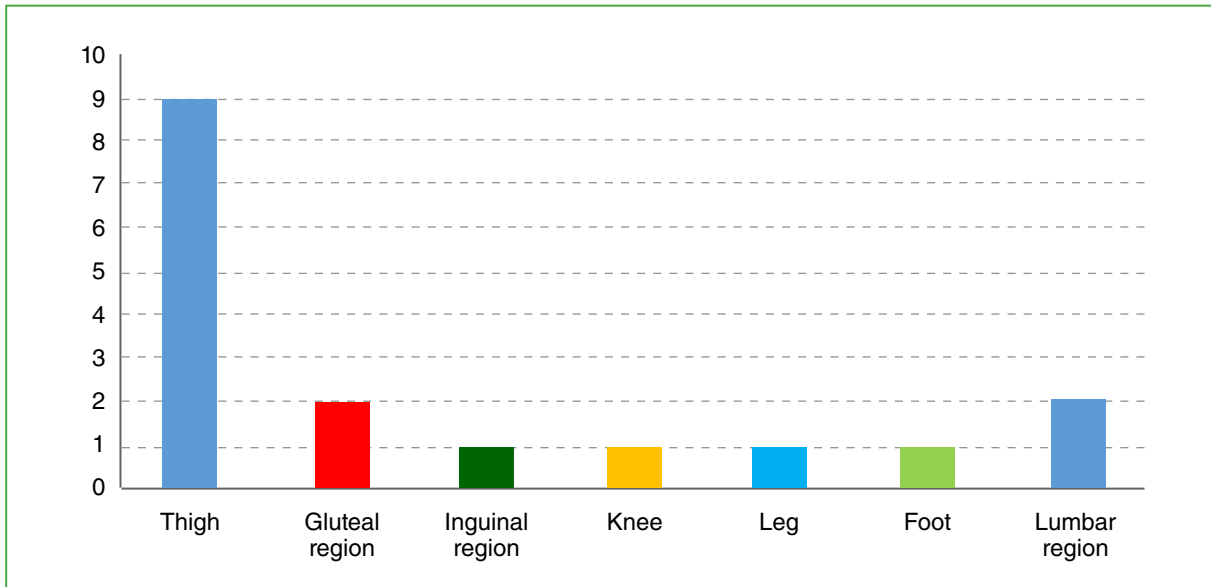


Figure 1. Topographic location.

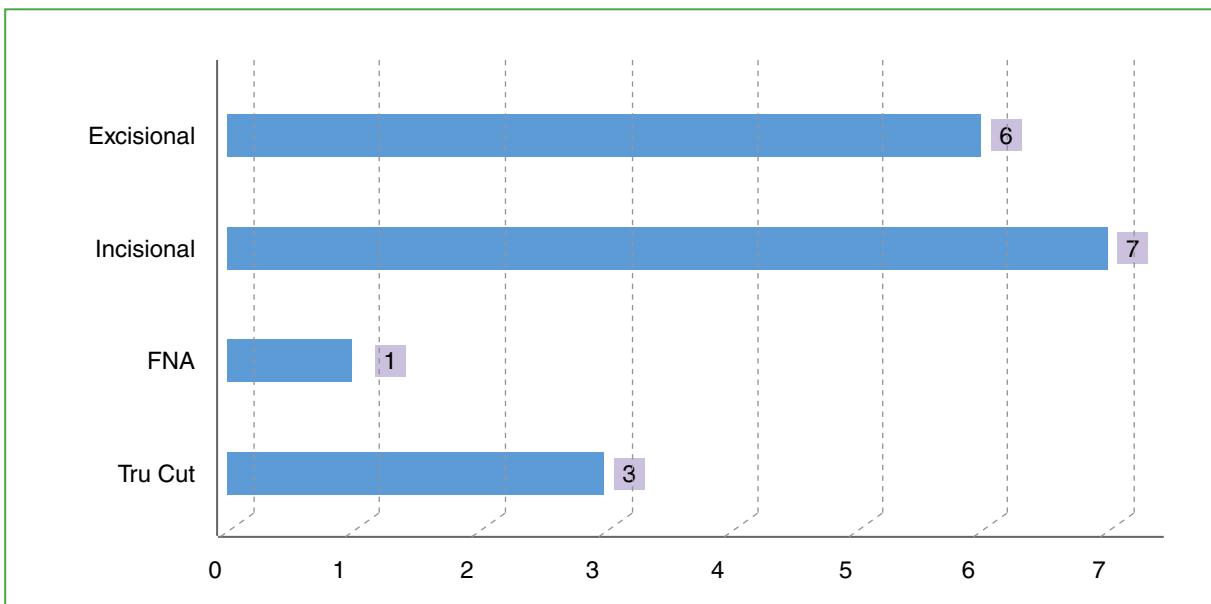


Figure 2. Types of biopsy. *One of the incisional biopsies had been performed in a different institution from the one that performed the definitive treatment.

A single patient (case 8) suffered a partial recurrence at 5.5 years of follow-up, which represented 5.9% of the series. At the end of the study, the patient was stable and without progression. No functional disorders or sequelae were observed, except in one patient with a depressed and retractile wound in the gluteal area.

DISCUSSION

Lipoblastoma is a benign tumor composed of adipocytes in different stages of maturation, immersed in myxoid stroma and separated by connective septa of different thicknesses. The term was coined by Jaffe in 1926.⁴ They are generally asymptomatic, superficial tumors located on the trunk and extremities, although many other locations are also possible.^{5,6} In 15 of our patients, the tumor was located in the lower limbs, in eight of them the thigh was affected, a figure very similar to that of the cases described in the literature.³ Cases close to the root of the thigh or to the inguinocrural or perineal area are not infrequent (Figure 3),⁷⁻¹¹ and the location in the foot has also been reported.¹



Figure 3. Case 2. Thigh tumor.

It appears, with greater frequency, in infancy and childhood, 75-90% of the cases corresponded to patients <3 years of age.⁵ The average age of our series coincides with this data (3 years and 2 months), and 11 of the 17 patients were <4 years old, as in other series.^{7,12} In these series, it predominated in males, as occurred in our study (65% of males).

As it is a case of slow growth, the reason for consultation is almost always the tumor, the comparative asymmetry of the region, or both signs (Table, Figure 3).

When a patient with these characteristics presents, imaging studies are usually requested. Simple radiographs with soft tissue density are not very useful, except for roughly delimiting the mass (Figure 4).



Figure 4. Case 2. The anteroposterior radiograph of the pelvis and thigh with soft tissue density roughly delimits the mass.

Ultrasound studies are usually the first line of investigation due to their availability and because they do not require sedation or anesthesia.^{13,14} In 16 of our patients it was the first study. In contrast, MRI easily distinguishes the fatty components of the lipoblastoma, as well as the cystic components and vascularity, facilitating the diagnosis;¹⁴ in this series, 16 patients were also studied with MRI (Figure 5).

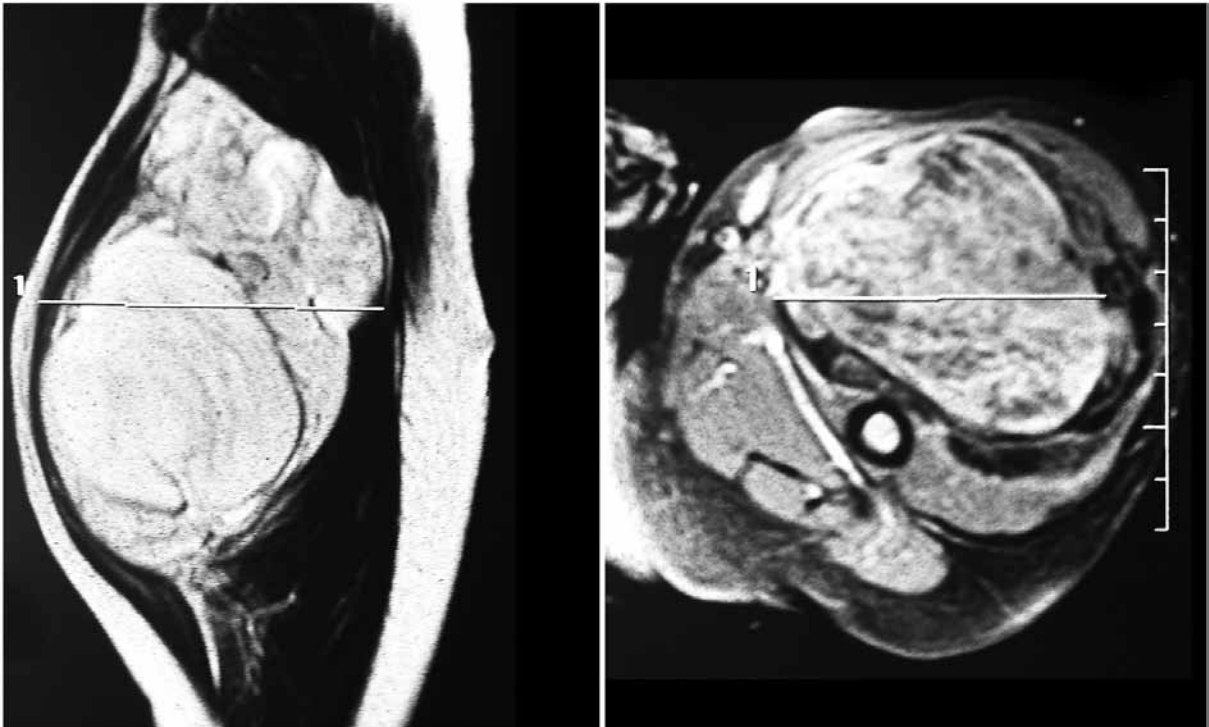


Figure 5. Case 2. Magnetic resonance imaging of the mass, sagittal slices in T1 sequence and axial slices in T1 sequence with gadolinium and fat suppression. An intramuscular tumor is observed in the anterior compartment of the proximal third of the left thigh, well circumscribed with a heterogeneous internal structure. It is hyperintense on the sagittal image, similar to subcutaneous fat, with heterogeneous enhancement on the axial image.

Although it is difficult to differentiate between lipoblastoma and myxoid liposarcoma by MRI, given the extreme rarity of the latter condition in children <10 years of age, visualizing a lipomatous lesion with non-adipose components in a young child is much more suggestive of a lipoblastoma than a malignant lesion.^{13,15}

The biopsy for the anatomopathological study can be of different types: by incision, by excision, by puncture with a fine needle or by puncture with Tru-Cut needles. Most of our patients underwent open biopsy (by incision or excision) (Table).

However, needle biopsies can serve as a useful tool in the preoperative diagnosis of lipoblastoma^{16,17} and can be performed with minimal anesthesia. It is more difficult for pathologists to safely identify and classify soft-tissue lesions from material obtained from a needle biopsy (especially fine-needle aspiration), but this can be done fairly safely.¹⁷

The age of presentation, the histopathological examination and the chromosomal markers are the three factors that help to arrive at the final pathological diagnosis.

From the histopathological point of view, lipoblastoma is a cellular neoplasm of lobular architecture, composed of immature adipocytes (lipoblasts) that show different degrees of differentiation and maturation, from true lipoblasts to mature adipocytes, primitive mesenchymal cells, myxoid matrix, with relatively well-defined fibrous septa, a fine vascular network, and a peripheral pseudocapsule.^{3,9,18,19} The abnormal mitoses characteristic of liposarcoma are not seen in lipoblastoma.³

Histologically, they are classified as: classic, myxoid, lipoma-like and hibernoma-like.^{5-7,12} In our series, all were of the classic type, except three that were lipoma-like (Table).

Table. Case data

Case	Sex	Age at surgery [*]	Location	Reason for consultation	Imaging studies	Lesion volume	Pathological Anatomy	Biopsy Type	Resection Type	Follow-up [*]	Relapse
1	F	4.4	Right thigh	Tumor	USG/MRI	270.4 cm ³	Lipoma-like lipoblastoma	Puncture (Tru-Cut)	Marginal	5.6	No
2	M	3.08	Left thigh	Tumor	Radiograph/USG/MRI	410 cm ³	Lipoma-like lipoblastoma	Puncture (Tru-Cut)	Marginal	5.3	No
3	F	2.9	Right gluteal region	Tumor	USG/MRI	92.2 cm ³	Lipoma-like lipoblastoma	Puncture (Tru-Cut)	Marginal	2	No
4	M	0.92	Left thigh	Asymmetry	Radiograph/USG/MRI	32.2 cm ³	Lipoblastomatosis	Excision	Marginal	0.7	No
5	M	3	Right lumbar region	Tumor	Radiograph/USG/MRI	54.5 cm ³	Diffuse lipoblastoma	Excision	Marginal	1.4	No
6	M	4.2	Right thigh	Tumor	Radiograph/USG/MRI	1118.5 cm ³	Lipoblastoma	Incision [#]	Marginal	1.6	No
7	F	10.08	Right thigh	Asymmetry	MRI	NA	Lipoblastoma	Excision	Marginal	2	No
8	F	7.08	Left lumbar region	Tumor	USG/MRI	29.1 cm ³	Lipoblastoma	Excision	Marginal	5.5	Yes
9	M	1.5	Right thigh	Tumor	USG/MRI	10.2 cm ³	Lipoblastoma	FNA	Marginal	2.16	No
10	M	3.6	Left foot	Tumor	Radiograph/USG/MRI	46.7 cm ³	Lipoblastoma	Excision	Marginal	3	No
11	M	0.92	Right leg	Tumor	USG/MRI	89.2 cm ³	Lipoblastoma	Incision	Marginal	3.3	No
12	F	1.25	Right gluteal region	Tumor	USG/MRI	616 cm ³	Lipoblastoma	Incision	Marginal	1.16	No
13	M	7.6	Left thigh	Tumor	Radiograph/USG/MRI	1188.2 cm ³	Lipoblastoma	Incision	Marginal	2.75	No
14	M	7.92	Left thigh	Tumor	USG/MRI	41.5 cm ³	Lipoblastoma	Excision	Marginal	1.5	No
15	M	2.6	Right inguinal region	Tumor	USG/MRI	137.4 cm ³	Lipoblastoma	Incision	Marginal	2.25	No
16	M	3.25	Right knee	Tumor	USG	28.5 cm ³	Lipoblastoma	Incision	Marginal	2	No
17	F	1.7	Right thigh	Asymmetry and tumor	Radiograph/USG/MRI	1745.8 cm ³	Lipoblastoma	Incision	Marginal	3.8	No

M = male, F = female, USG = ultrasonography, MRI = magnetic resonance imaging, NA = not available. FNA: fine-needle aspiration *In years, #Procedure performed in a Center other than that of the final treatment.

Occasionally, a heterogeneous appearance and some histological coincidence with other lipogenic tumors are described; in these cases, microscopy cannot differentiate them from malignant fatty tumors such as myxoid liposarcoma, round cell liposarcoma, and well-differentiated liposarcoma.²⁰ When microscopy is not helpful, genetic, immunohistochemistry, molecular biology, and pathological anatomy studies are used.^{2,3,21,22} In our 17 cases, the characteristic histopathological findings, associated with age and imaging studies, were sufficient to establish a definitive diagnosis; therefore, no immunohistochemistry or molecular studies were required.

In general terms, we can say that they present in two clinical forms: circumscribed, subcutaneous tumors, preferentially located in the extremities (70%), and the infiltrative and diffuse form of a rather deep location with a greater tendency to recurrence and less well-defined margins, called lipoblastomatosis (30%).^{5,23}

The latest edition of the classification of soft tissue tumors of the World Health Organization divides these lesions into: benign, intermediate (locally aggressive), intermediate (which rarely metastasize) and malignant,⁵ and in general, lipoblastomas are included among the benign ones.¹³⁻¹⁵ This publication explains that staging is not clinically relevant, but the relapsing and infiltrative nature of many of its forms is also recognized, and there are no guidelines that can make a prognostic distinction in this sense.⁵ It would be useful, therefore, to design a staging system that would provide a prognosis of the possibilities of post-surgical recurrence.

The differential diagnosis should consider other benign lesions (such as lipomas in their different varieties) and malignant lesions (such as the different types of liposarcomas, rhabdomyosarcoma, and desmoid tumor).⁵ Age is not an absolute factor in these differential diagnoses, but it is very useful, since, for example, liposarcomas are very rare in young children.⁵

The treatment of all our patients was the same: complete removal by intracompartmental, marginal resection, a generally accepted procedure (Figure 6).^{7,11,18,19} Despite the excellent prognosis of said treatment, the recurrence rate is 12-25%,^{10,19} and it can reach 33-46%.² This high rate of recurrence is more often associated with the infiltrative variety or lipoblastomatosis or in cases of incomplete resections.^{19,20,24} Considering the average follow-up of almost three years in our series and the fact that a large percentage of patients exceeded two years, the 5.9% recurrence rate in this study seems low despite not completing the five-year follow-up.

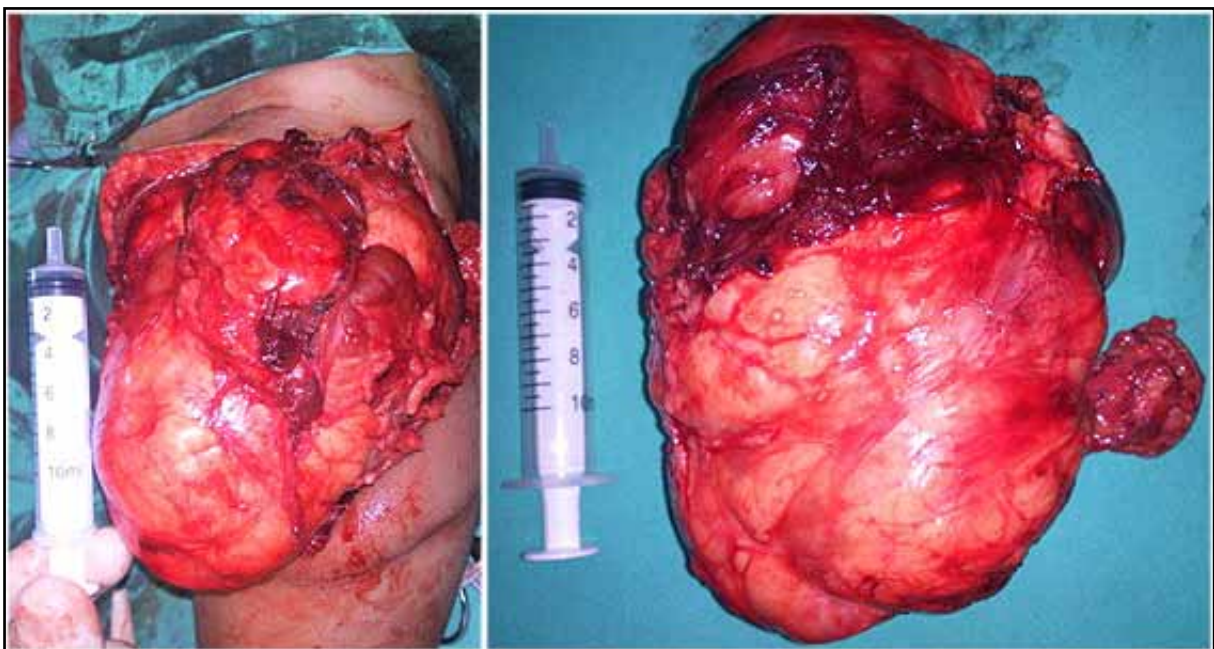


Figure 6. Case 2. Intraoperative images showing the extraction of the tumor mass and the surgical piece with its comparative volume

This study has some obvious limitations: it is retrospective, the interinstitutional diagnostic methods were different, and it has a very basic statistical analysis, with little statistical power. However, as it is a multicentric study on only two locations (limbs and back) and with a significant number of cases for a less prevalent pathology, valid disquisitions can be made.

Until the end of the study, only one patient (5.9%) had a partial recurrence that, 5 and a half years after surgery, remained stable: strikingly, it was one of the cases located in the trunk and not in the limbs (Table, case 8). Conclusions cannot be drawn from a single case but, considering the particular anatomical factors of the region, it could be hypothesized that this relapse is related to the greater technical difficulties of performing a complete marginal resection in the dorsal musculature.

The high rate of local recurrence means that follow-up must be strict for several years,^{1,7} up to 6 or 8 years.^{2,3,5,9,10,19,24} Now, the mean follow-up time of this series was 2 years and 10 months (range: 8 months to 5 and a half years), and although this is not enough to rule out future recurrence, 12 of the 17 patients had exceeded two years of follow-up.

Although some authors recommend a wide local resection, especially for the diffuse form, given the benignity of the pathology and even with a high rate of recurrence, they agree with other authors^{3,19,20,25} that radical, mutilating surgery is not recommended. Furthermore, in this series, there were also no immediate or late postoperative complications with marginal ablation (Figure 7); only one patient presented a depression with umbilication of the surgical scar. This argues in favor of marginal resection in this type of lesion.

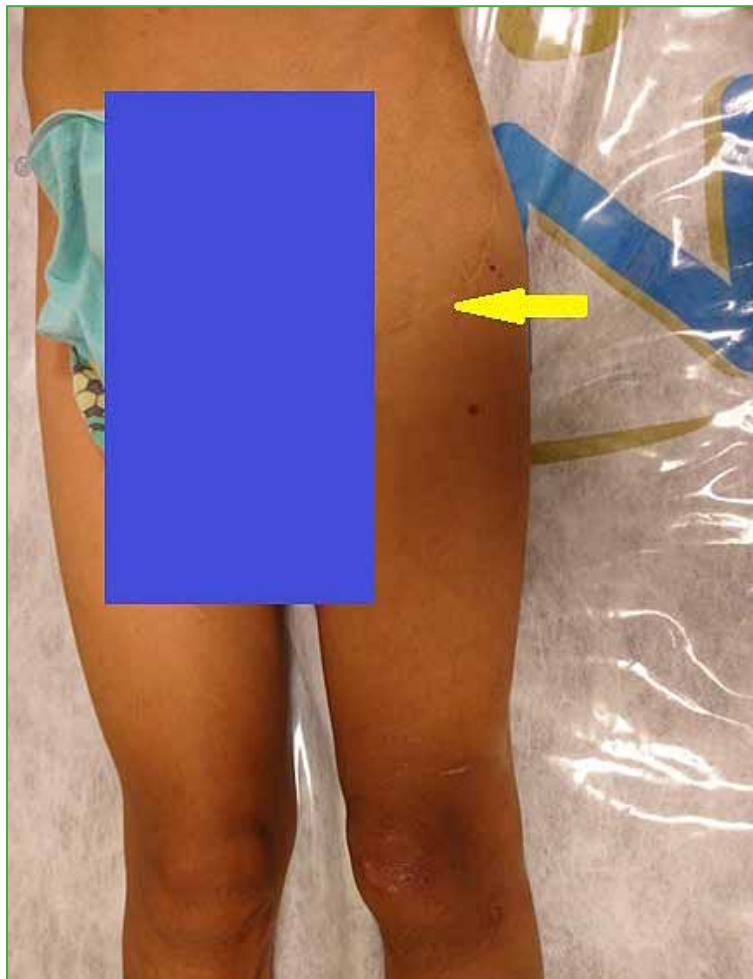


Figure 7. Case 2. Image at 5 years and 4 months of postoperative follow-up; the arrow marks the scar of the approach.

CONCLUSIONS

Complete marginal resection of a lipoblastoma that appears on the extremities and trunk of neonates and young children as a progressively growing, painless mass offers good success rates with minimal complications. There may be recurrence in these locations, although the rate may be lower than previously reported and, in general, it does not usually compromise the final outcome.

Conflict of interest: The authors declare no conflicts of interest.

J. J. Masquijo ORCID ID: <https://orcid.org/0000-0001-9018-0612>

M. Salom Taverner ORCID ID: <https://orcid.org/0000-0002-8626-2401>

S. Fiscina ORCID ID: <https://orcid.org/0000-0003-2655-4063>

S. F. Innocenti ORCID ID: <https://orcid.org/0000-0001-5650-1056>

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