CERVICAL LIPOBLASTOMA: CASE REPORT, REVIEW OF LITERATURE, AND GENETIC ANALYSIS

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Abstract: Background. Lipoblastoma is a rare, benign tumor of infants and children, usually occurring in the extremities and trunk, with only a few cases reported in the neck.

Methods. We describe the case of an infant with a rapidly enlarging, painless neck mass. MRI revealed a 4-cm-diameter mass deep to the paraspinal muscles, in close proximity to the C2 vertebral foramen. Review of literature, diagnostic methods, and genetics of lipomatous tumors are discussed.

Results. Complete surgical excision via a posterior cervical approach demonstrated irregular lobules of immature fat cells separated by a loose, myxoid connective tissue. Histology and genetic analysis confirmed the diagnosis of lipoblastoma.

Conclusion. Cervical lipoblastoma is rare, and typically presents as an asymptomatic, painless mass, rarely causing airway obstruction or nerve compression. MRI can be helpful in identifying the lipomatous nature of the mass, but the findings can be inconsistent due to variable maturity of fat cells and the mesenchymal content of the tumor. Chromosomal analysis is useful in differentiating lipoblastoma from liposarcoma. Recommended treatment is complete surgical excision.

Keywords: lipoblastoma; lipoma; lipoblastomatosis; liposarcoma; cervical; neck mass; children; pediatric; skull base

Lipoblastoma is a benign tumor of embryonal fat cells occurring in infants and children, arising primarily in the trunk and extremities. Only 16 cases of lipoblastoma of the neck have been reported in the literature.1–9 Cervical lipoblastoma typically presents as a rapidly enlarging, painless neck mass. Symptoms, however, can occur from compression of cervical structures, including respiratory compromise,5,6 Horner’s syndrome,5,10 and hemiparesis.10 Diagnosis is often suggested by CT and MRI findings, but can only be confirmed by microscopic examination. The tumors typically contain adipocytes in different stages of maturation. Lipoblastoma should be differentiated from other tumors of lipomatous origin. The recommended treatment is complete surgical excision.11 We present a case of an asymptomatic lipoblastoma of the right posterior neck in a 2½-year-old boy. A review of literature, diagnostic tools, and histologic and genetic aspects of the tumor are discussed.

A review of 35 cases of lipoblastomatosis by Chung and Enzinger12 showed that 65% of cases were located in the trunk or limbs. Collins and Chatten,9 in a review of 25 cases of lipoblastoma and lipoblastomatosis, found that 79% occurred...
in boys and 84% occurred before the age of 5. The average age of patients with lipoblastoma was 4.2 years. Eleven of 25 tumors occurred in an extremity and 5 (20%) occurred in the head and neck. Other sites included groin, back, chest, flank, labia, and retroperitoneum. Thirteen occurred on the left side, and 5 occurred on the right.

**CASE REPORT**

A 2½-year-old boy presented with a 6-month history of an enlarging, painless right posterior neck mass. There was no history of trauma, infection, dysphagia, dyspnea, stridor, or fever. Past medical history was unremarkable. His childhood developmental milestones were appropriate, except for a slightly delayed onset of speech. Physical examination revealed a well-developed and well-nourished child with a firm mass, approximately 4 cm in diameter, located in the right posterior triangle of the neck, starting at the midline and extending to the hairline superiorly and toward the base of the neck inferiorly (Figure 1). It was nontender and nonerythematous. He had full range of motion of the neck and had no neurologic deficits.

MRI demonstrated a well-defined 3.7-× 3.7-cm mass in the prevertebral region of the posterior neck, extending toward the spine with encroachment of the right C2 vertebral foramen, but without compression of the thecal sac (Figure 2). Most of the mass was isointense to muscle on T1-weighted images, but many large areas disappeared with T1-weighted fat suppression sequences.

FIGURE 1. A 2-year-old boy with an enlarging, painless posterior neck mass 4 cm in diameter, which was diagnosed histologically as lipoblastoma. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]

T2-weighted images demonstrated heterogeneous hyperintensity. Fine-needle aspiration biopsy revealed fibroadipose tissue.

Surgical excision via a posterior cervical approach demonstrated a well-encapsulated, soft, yellowish-white mass deep to the trapezius, splenius capitis, semispinalis capitis, and splenius cervicis muscles. The mass was successfully dissected away from the C1 and C2 foramina, without neurological compromise. The postoperative course was benign without neurologic deficits. At 20-month follow-up, the child is doing well and developing normally without recurrent tumor.

Pathological evaluation of the tumor demonstrated a multilobular appearance (Figure 3) with a glistening cut surface. Microscopic examination demonstrated immature adipocytes surrounded by myxoid material, and lobulation characteristic of lipoblastoma (Figures 4A and 4B). The cytogenetic composition of the tumor, as determined by Genzyme Genetics, was: 47 to 49, xy +mar1, +mar2, +mar3[4], 98, idemx2[1]. Metaphase fluorescence in situ hybridization (FISH) analysis using whole chromosome paints for chromosomes 8 and 12 showed that the large markers were derived primarily from chromosome 8 with some material from another chromosome on both ends of the chromosome 8 derivatives (Figure 5). In 3 of the 4 cells, the small marker was derived from chromosome 12 and the small marker in the fourth cell had material from chromosome 8. The presence of polysomy for regions of chromosome 8...
in complex rearrangements is consistent with lipoblastoma.

**DISCUSSION**

Lipoblastoma is an unusual benign tumor of immature white fat typically found in the axilla, mediastinum, retroperitoneum, prevertebral areas, and extremities, with only 16 reported occurrences in the neck. More than 90% of lipoblastomas occur before the age of 3, and a male predominance ranging from 3:2 to 4:1 has been observed. Cervical lipoblastoma typically presents as a rapidly enlarging, painless mass. Although generally asymptomatic, cases of respiratory compromise, 2 cases of Horner’s syndrome, and a case of hemiparesis have been reported, all of which resulted from compression of cervical structures. A case of upper extremity weakness was reported by O’Donnell et al., which was caused by compression of the spinal cord.

The differential diagnosis of lipomatous tumors should include lipoma, lipoblastoma, hibernoma, and liposarcoma. Lipomas are adipose tumors that are composed of only mature fat and do not show lobulation. The presence of lipoblasts is helpful in distinguishing lipoblastoma from other benign adipose tumors.

Lipoblastoma was originally described in the groin by Jaffe in 1926. Chung and Enzinger later classified embryonal white fat tumors into the well-encapsulated, localized lipoblastoma, and a more diffuse, multicentric, poorly localized variant for which they coined the term lipoblastomatosis.

Lipoblastoma is defined as a discrete adipose tissue tumor containing immature fat cells subdivided into lobules by septae. Liposarcoma is exceedingly rare in children under the age of 5 and is different histologically from lipoblastoma. It is important to recognize that both tumors may contain mitotic figures, as lipoblastoma is a mass of embryonic fat cells in varying degrees of differentiation. Though both tumors may contain a plexiform capillary network, this feature tends to be more prominent in liposarcoma. It is particularly important to differentiate myxoid liposarcoma from lipoblastoma, as both tumors have myxoid background. The characteristic lobulation of lipoblastoma is a feature that is typically absent in liposarcoma, but can be seen in the myxoid vari-
Hyperchromasia and nuclear atypia are present in liposarcoma, but are absent in lipoblastoma, and may be the most salient distinguishing feature.

An additional tumor that should be considered in the differential diagnosis of lipoblastoma is the hibernoma, which is a tumor of embryonic brown fat. Hibernoma also displays a lobular pattern, but it is composed entirely of brown fat with a characteristic eosinophilic, granular cytoplasm that is not present in the white fat of lipoblastoma.

A review of 25 cases of lipoblastoma by Collins and Chatten demonstrated that all tumors were subdivided by fibrous septae and contained adipocytes in varying degrees of maturity. Prominent vascularity was observed in the majority of lipoblastomas studied, and about half contained myxoid foci. The present case demonstrated fibrous septae and variable maturity of adipocytes, as well as a distinct myxoid component, though a significant degree of vascularity was not observed.

Different lipomatous tumors, such as lipoma, lipoblastoma, and liposarcoma, tend to have characteristic chromosomal abnormalities, and such genetic variables have been receiving increasing attention in the literature for their potential diagnostic value. Lipomas have abnormalities of chromosomes 12, 6, or 13, including variable translocations in chromosome 12. Liposarcoma tends to have the translocations t(12;16)(q13;p11) or t(12;22)(q13;q12). Hibernoma shows rearrangement in chromosome 11q13.
Lipoblastoma has been noted to consistently contain breakpoint abnormalities in chromosome 8q.\textsuperscript{7,8,11,20,21} These chromosomal anomalies can be used as a diagnostic supplement to histologic assessment in differentiating lipoblastoma from liposarcoma.\textsuperscript{7,8,11,20,21} It has been further proposed that such abnormalities of chromosome 8q may be associated with upregulation of the production of the PLAG1 gene, which is considered to be the likely oncogenic target in lipoblastoma formation.\textsuperscript{20}

Chromosomal abnormalities in the current case serve to demonstrate the important supplemental role of cytogenetics in the diagnosis of lipoblastoma, but they are by no means a substitute for a careful histological assessment.

Diagnostic imaging studies are invaluable in the preliminary diagnosis of fatty tumors. CT can be used to demonstrate the presence of a mass, but MRI is particularly helpful in its ability to suggest the histologic components of the tumor, as well as its more accurate estimation of the extent of disease, particularly in lipoblastomatosis.\textsuperscript{11} Lipoblastoma typically appears hyperintense on both T1- and T2-weighted images, though it is consistently less intense than mature fat on T1-weighted images, likely due to its fibrous septae and the variable degree of lipomatous differentiation. Lipocytes, or mature fat cells, exhibit relatively high signal intensity on T1-weighted images, while lipoblasts show lower intensity.\textsuperscript{22} In this manner, MRI can show the relative contribution of mature and immature fat cells in a lipomatous mass.

The degree of intensity on T2 images also varies, primarily depending on the amount of myxoid and fibrous components.\textsuperscript{22} Myxoid stroma and lipoblasts will exhibit high intensity on T2-weighted images.\textsuperscript{22} Therefore, despite the usefulness of MRI in assessment of lipoblastoma, it is not diagnostic, due to the presence of similar findings in other benign and malignant fatty tumors. Histologic analysis, therefore, is still mandatory.

The technique of fat suppression sequencing is particularly valuable in the assessment of lipoblastoma in its ability to demonstrate the presence of fatty tissue even when standard T1 and T2 images fail to demonstrate sufficient hyperintensity of the tumor to indicate such content. This was particularly true in the current case, in which T1 images demonstrated the tumor to be isointense with muscle, likely due to its high fibrous content. The disappearance of much of the mass on fat suppression sequences confirmed the presence of a distinctly lipomatous component.

Despite the well-localized, nonmalignant nature of lipoblastomas, they are notably rapidly growing tumors and may eventually cause compressive symptoms. Lipoblastoma does not recur when completely resected, but lipoblastomatosis has a distinct propensity for recurrence.\textsuperscript{11} Therefore, the standard therapy for cervical lipoblastoma is complete surgical excision.

**CONCLUSION**

The present case demonstrates a 2½-year-old boy who underwent complete surgical resection of an asymptomatic, painless right posterior cervical lipoblastoma. MRI was clearly helpful diagnostically in identifying a lipomatous tumor, though it was insufficient to establish the diagnosis of lipoblastoma versus liposarcoma or hibernoma. Cytogenetic analysis plays an increasingly important role in the diagnosis of lipoblastoma. The presence of chromosomal abnormalities characteristic of lipoblastoma suggests that such methods are a useful supplement in diagnosing this tumor, but by no means an adequate replacement for careful histologic analysis. This case also demonstrates the need to consider lipoblastoma, along with other lipomatous tumors, in the differential diagnosis of all pediatric neck masses.

**REFERENCES**