Solid Tumour Section
Mini Review

Soft tissue tumors: Lipoma / benign lipomatous tumors

Nils Mandahl
Department of Clinical Genetics, Lund University Hospital, 221 85 Lund, Sweden (NM)

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Identity

Note
Lipomas are benign adipose tissue tumors with many subtypes, constituting one-third of all soft tissue tumors.

Classification

Ordinary lipoma: the solitary, ordinary lipomas represent the most common soft tissue tumors, with subcutaneous tumors being much more common than the deep-seated ones.
Epidemiology: the incidence of lipomas is about one in 1000 inhabitants per year, but is probably underestimated since many lesions cause few problems; they occur most frequently between 30 and 70 years of age, with a peak incidence between 40 and 60 years.
Clinics: solitary lipomas are slow-growing masses, most frequently located in the upper back, neck, shoulder, abdomen, and the proximal portions of the extremities.
Evolution: surgery is required primarily when the tumors reach large size and cause cosmetic problems or complications due to their anatomical site; there is no risk of progression to malignancy, and recurrences are rare after shelling-out.
Angiolipoma: angiolipomas show characteristic histological features and occur primarily as subcutaneous, painful nodules; multiple lesions are much more common than solitary ones; they are usually smaller than solitary, ordinary lipomas and present at an earlier age, with the dominating site being the forearm; an increased familial incidence has been noted.
Spindle cell/pleomorphic lipoma: the characteristic feature of spindle cell lipoma is the replacement of mature fat by collagen-forming spindle cells; these rare tumors typically occur subcutaneously in the neck and shoulders of men aged 45 to 65 years.
Pleomorphic lipoma probably represents a highly pleomorphic variant of spindle cell lipoma and show similar clinical features; both of these types of lesions may be confused with liposarcoma.
Lipoblastoma: lipoblastoma is a tumor of the infancy; most tumors occur before three years of age and may occasionally be seen already at birth; the site is primarily the upper and lower extremities; there may be a close resemblance to myxoid liposarcoma.
Hibernoma: hibernoma is chiefly a tumor of adults, although in average occurring at lower ages than solitary, ordinary lipomas; the most common sites are the scapular and interscapular regions, mediastinum and upper thorax.
Angiomyo-lipoma: angiomyolipoma is a hamartomatous lesion in the kidneys of adult patients, with a preponderance of women.
Chondroid lipoma: chondroid lipoma is a rare tumor occurring in the subcutis or muscle of adults; it may be confused with liposarcoma and chondrosarcoma, and shows microscopic features of both lipoma and hibernoma.

Cytogenetics

Cytogenetics Morphological

Ordinary lipoma: The majority of tumors show fairly simple, structural chromosome aberrations; numerical changes are rare; seemingly balanced aberrations dominate over unbalanced changes, as also indicated by the finding of no copy number changes in smaller series of lipomas investigated by CGH.
In more than two-thirds of cases with karyotypic changes, there is an involvement of chromosome segment 12q13-15, which may recombine with a large variety of other chromosomal segments; so far, more than 80 of the 320 chromosome bands in the standard karyotype have been involved in these rearrangements. The most frequent aberration is t(3;12)(q27-28;q14-15), found in one-fifth of cases with 12q13-15 changes. Other recurrently involved chromosome segments include 1p36, 1p32-34, 2p22-24, 2q35-37, 5q33, 10q22, 11q13, 12p11, 12q24, 13q12-14, and 21q11-22; all recurrent changes combined represent 75% of cases with 12q13-15 changes and 45-50% of all karyotypically abnormal ordinary lipomas among cases without 12q13-15 changes, one subset of tumors display translocations involving 6p21-23 and another subset have loss of 13q material with breakpoints in 13q12-14 and/or 13q22; many of the latter aberrations are seen as del(13)(q12-22); these 6p and 13q changes are found at similar frequencies, each occurring in 6-8% of ordinary lipomas with cytogenetic aberrations. Some 15-20% of the aberrant tumors have rearrangements involving neither 6p21-23, 12q13-15, 13q12-14 nor 13q22.

**Cytogenetics Molecular**

The rearrangements frequently affect the high mobility group protein gene HMGIC in 12q15, with most breakpoints occurring in the large intron 3; the outcome of the 3;12-translocations is the formation of a chimeric gene involving HMGIC and LPP. LPP is a member of the LIM protein gene family, containing a leucin-zipper motif in its amino-terminal region and three LIM domains in its carboxy-terminal region. Result of the chromosomal anomaly: the HMGIC/LPP transcripts frequently contain coding sequences for the three DNA-binding domains of HMGIC and two or three LIM domains from LPP; HMGIC/LPP is not specific for lipomas, but has also been identified in a series of pulmonary chondroid hamartomas with t(3;12), and HMGIC is rearranged in a variety of benign tumors. Another fusion has been with LHFP in a lipoma with t(12;13)(q13-15;q12); the expressed HMGIC/LHFP fusion transcript encoded the three DNA binding domains of HMGIC and 69 amino acids from frame-shifted LHFP sequences. A candidate gene for rearrangements affecting 6p21 in lipomas is HMGY.

**Cytogenetics Morphological**

**Angiolipoma:** subcutaneous angiolipomas have a normal karyotype as shown by chromosome banding. **Spindle cell/pleomorphic lipoma:** few cases have been investigated cytogenetically; the characteristic features are losses of chromosome 13 and 16 sequences, in particular involving the segments 13q12 and 16q13-qter, respectively.

**Lipoblastoma:** few cases have been investigated cytogenetically; they have all had rearrangements of 8q11-13 in common; this segment has been found to recombine with a variety of other chromosome bands; preliminary data have indicated that the PLAG1 gene in 8q12 is affected, resulting in a similar promoter swapping as has been described in pleomorphic adenomas of the salivary gland.

**Hibernoma:** the characteristic feature is rearrangements of 11q13, which may recombine with a variety of other chromosome bands; in contrast to ordinary lipomas, no translocations involving both 11q13 and 12q13-15 have been found in hibernomas. FISH analyses have demonstrated that both homologs of chromosome 11, including the seemingly normal one, have deletions encompassing the multiple endocrine neoplasia type I, MEN1, locus and a second region about 3 Mb distal to MEN1.

**Angiomyo-lipoma:** few cases have been investigated cytogenetically; the only recurrent change identified has been trisomy 7; however, interphase FISH analysis did not reveal any significant fraction of cells with +7 in the angiomylipomas investigated.

**Chondroid lipoma:** a cytogenetically identical rearrangement, t(11;16)(q13;p13), found in the only two cases reported indicate that this is a recurrent aberration.

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