Lipomas of the head and neck

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Learning objectives

- To detail the location of lipomas of the head and neck.
- To understand the embryology involved in intracranial head and neck lipomas.
- To be aware of the associated findings of head and neck lipomas.
- To describe the imaging characteristics of head and neck lipomas across the spectrum of imaging modalities.

Background

INTRACRANIAL LIPOMAS

Intracranial lipomas are rare lesions representing less than 0.1% of all intracranial tumours [1]. The location is classically at or close to the midline, usually in the pericallosal cistern.

Common locations include [2]:

- Interhemispheric fissure (45%) on page 4
- Quadrigeminal cistern (25%) on page 4
- Suprasellar cistern (15% on page )
- Cerebellopontine angle cistern (10%)
- Sylvian cistern (5%)

More than half of intracranial lipomas have associated findings, again these most commonly affect midline structures. Classically the interhemispheric lipomas are associated with agenesis or dysgenesis of the corpus callosum, but findings relate to location and size of the lipoma.

Associated findings include [1,3]:

- Agenesis/Dysgenesis of the corpus callosum on page
- Cerebellar vermis hypoplasia
- Aqueductal stenosis
- Hypoplasia of the Pons
- Hypoplasia of the inferior colliculus
- Arterial aneurysms and arteriovenous malformations
Intracranial lipomas are usually incidental findings with symptoms being rare. As such, surgical resection is usually not considered for intracranial lipomas. The risks of resection are liable to outweigh the benefits owing to the strong attachment of the lipoma to surrounding structures and the presence of nerves and vessels within them. Indeed, in cerebellopontine angle lipomas, the seventh and eighth cranial nerve complex can sometimes be seen to coarse through the lipoma[1]. The presence of a lipoma in the subarachnoid space can lead to interference in growth of cortical tissue with resultant cortical dysplasia [3].

**Associated symptoms [1,3]:**

- Headaches
- Seizure activity secondary to cortical dysplasia
- Cranial nerve deficits

**Embryology**

The consensus opinion is that intracranial lipomas are congenital malformations resulting from the abnormal persistence and differentiation of the meninx primitiva (the developmental precursor of the meninges) during the development of the subarachnoid cisterns [1]. The persistent mesenchyme subsequently differentiates into fatty tissue. This theory explains the subarachnoid location of intracranial lipomas and the presence of neurovascular structures within them. In addition the frequencies of location of intracranial lipomas is explained by the sequence of dissolution of the meninx primitiva [1].

**EXTRCRANIAL LIPOMAS OF THE HEAD AND NECK**

Benign lipomas are the most common soft tissue tumour in the head and neck, that said only 13% of lipomas occur in the head and neck [4]. There is an equal distribution between the sexes, with presentation most commonly after the age of 40 years and in a subcutaneous location. The most common location for a head and neck lipoma is in the posterior neck [4]. Lipomas consist of mature fat cells, arranged in lobules separated by thin fibrous septae and surrounded by a capsule.

**Locations of head and neck lipomas [5]:**

- **Posterior neck (most common)** on page 6
- **Anterior neck** on page 8
- Infratemporal fossa
- Oral cavity
- Pharynx
- Larynx
The most important differential diagnosis is liposarcoma. The incidence of liposarcoma is low, with approximately 250 cases diagnosed annually in the United State. Furthermore the majority of liposarcomas are found in the retroperitoneum and extremities with only approximately 5% of cases occurring in the head and neck. Liposarcomas originate from primitive mesenchymal cells and not from mature fat cells. Malignant transformation from benign lipomas is not thought to occur.

Images for this section:

**Fig. 1**: Midline sagital CT image of the brain. A well-defined lesion is present running the length of the corpus collosom consistent with a lipoma. Attenuation values were measured at -55HU (not shown)
**Fig. 2:** T1 transverse image of the brain at the level of the midbrain shows a focal area of high signal in the region of the quadrigeminal plate. This lesion followed the imaging characteristics of fat on all sequences consistent with a lipoma.
**Fig. 3:** Transverse CT image shows a lobulated mass within the left parotid. No contrast enhancement is evident. Findings are consistent with a parotid lipoma.
Fig. 4: Sagittal T2 weighted image shows a well defined lesion in the posterior neck of intermediate signal, comparable to that of fat. T1 and CT images (figure 5) confirm this to be a lipoma. The posterior neck is the most common location of extracranial lipomas of the head and neck.
**Fig. 5:** Non-contrast transverse image of the brain in the same patient as figure 4 shows the lipoma overlying the left occipitut. The CT number is measured at -87HU.
Fig. 6: Transverse image from a contrast enhanced CT of the neck shows a dumb-bell shaped lipoma (arrow) in the anterior neck causing some mass effect on the left lobe of the thyroid. The CT number was measured at -91HU.
Imaging findings OR Procedure details

INTRACRANIAL LIPOMAS

Imaging appearance

The imaging findings of intracranial lipomas are usually characteristic allowing confidence in diagnosis. When encountering a lesion that may represent a lipoma it is vital to keep the common locations in mind.

Intracranial lipomas are most commonly diagnosed using either computed tomography (CT) or magnetic resonance imaging (MRI). The diagnosis can however be made using plain film or, in neonates, ultrasound (US).

*Plain film on page 12*

A large lesion may be seen as an area of radiolucency in the midline. Marginal calcification is often present where the lipoma merges with the surrounding cortical tissue. This can lead to the 'bracket' sign, with lucency evident between the brackets.

*Ultrasound*

Lipomas appear as abnormal echogenic foci commonly seen in the midline and showing posterior acoustic shadowing[6].

*CT on page 14*

Intracranial lipomas are sharply defined low attenuation lesions. No enhancement is seen following the administration of intravenous contrast. Calcification is often present, usually of the fibrous capsule surrounding the lesion although calcification can occur within the centre of the lesion. Attenuation values will be negative in keeping with the presence of fat, published attenuation values of intracranial lipomas range from -40 to -100 Hounsfield units (HU) [3].

*MRI*
The appearance of intracranial lipomas on MRI are that of a hyperintense lesion on T1 imaging on page 15 that becomes isotense on long TR images as the TE increases [1]. Large lipomas, normally in the interhemispheric fissure, may show chemical shift artifact. The appearance on fat saturated images on page 16 is that of a lesion isointense to grey matter.

Differential Diagnosis

- Dermoids - radiologically similar but amenable to resection. Tend to occur in the midline and have foci of calcification. Lobulated in shape and may demonstrate mass effect, unlike lipomas. High signal on T1 imaging but usually show heterogenous signal on T2 weighted images due to mixed composition.
- Epidermoids - On CT attenuation values are similar to fluid. This is apparent on MRI where signal mirrors that of cerebrospinal fluid. Atypical epidermoid exist which may be confused with lipomas if they demonstrate T1 shortening. No signal loss is demonstrated on fat suppression images however and epidermoids are classically high signal on diffusion weighted imaging.

EXTRACRANIAL LIPOMAS OF THE HEAD AND NECK

Imaging Appearances

If palpable these lesions are often referred for US, where a diagnosis can usually be made without the need for further imaging. Otherwise they are commonly incidental diagnoses at cross sectional examinations performed for other reasons

Ultrasound

Relative to adjacent muscle most (76%) of lipomas are hyperechoic, although iso- and hypoechoic forms exist [4]. They are commonly elliptical with a well defined border. They do not show posterior enhancement and are compressible. Lipomas have a heterogenous internal appearance, classically with multiple fine echogenic lines parallel to the skin surface. If the diagnosis contradicts the clinical impression, fine needle aspiration or cross sectional imaging may be required.

Computed Tomography
A lipoma is seen as low attenuation structure with a CT number matching that of fat. A capsule may be visible and there may be mass effect. No enhancement is evident following the administration of intravenous contrast.

Magnetic Resonance Imaging

Head and neck lipomas follow the signal characteristics on MRI. Chemical shift artifact can be seen with larger lipomas and signal will be suppressed on fat supression techniques.

Differential Diagnosis

- **Madelung disease (also known as Launois-Bensaude disease)**[4]. Accumulation of fat in middle aged Mediterranean men with a history of alcohol excess. The fat accumulates in the cervical and upper dorsal regions. The fat is diffuse. Ultrasound shows a mixed echogenicity lesion with no evidence of a capsule.
- **Angiolipoma**[7]. Rare tumours subdivided into non-infiltrating and infiltrating. Presents as a painful subcutaneous nodule. Non-infiltrating types are well defined and hyperintense on T1. The degree of central hypointensity reflects the vascularity. Strong enhancement is seen following intravenous contrast administration.
- **Hibernoma**[8]. Tumour of brown fat, slightly more common in women and usually peri- or intrascapular. Intermediate signal on MRI with marked contrast enhancement. Contains nodules and septae.
- **Liposarcoma**[9]. Classified into histological subtypes. Key finding to differentiate from a simple lipoma is the presence of a nodular or septated focus of non-adipose tissue. CT or MRI is required to confidently diagnosis.
- **Infiltrating lipoma**[10] - typical imaging characteristics of a lipoma but is not encapsulated and spreads to involves surrounding structures.
- **Dermoid**[4] - midline lesion that will contain a variable amount of fat in addition to fluid. Will show peripheral enhancement.
- **Epidermoid on page 18** - Unilocular or multilocular smooth ovoid non-enhancing lesions with low attenuation centre. Usually located in relation to the nose, brainstem, temporal bone and orbit. MR characteristics as described above.

Images for this section:
Fig. 1: Frontal view of the skull demonstrating the 'bracket' sign. Peripheral calcification around a lipoma of the corpus callosum gives rise to this appearance. Agenesis or Dysgenesis corpus callosum is a common associated finding.
**Fig. 2:** Transverse non-contrast image of the brain shows a low attenuation lesion in the suprasellar cistern consistent with a lipoma.
**Fig. 3:** Transverse T1 weighted image of the brain showing a midline lipoma as a high signal lesion. Signal was suppressed on fat saturation imaging (figure 5).
Fig. 4: Transverse fat suppressed image of the brain showing a midline lipoma as an intermediate signal lesion. The lesion was high signal on T1 (figure 4).

Fig. 5: Midline sagittal T2 weighted image of the same patient as in figures 3 & 4 demonstrating agenesis of the corpus callosum. This is a common associated finding in patients with inter-hemispheric lipomas.
**Fig. 6:** Low attenuation lesion in the ambient cistern compatible with lipoma (arrow)
Fig. 7: Well defined low attenuation mass in relation to the lateral aspect of the orbit. Proven at pathology to represent an epidermoid.
Conclusion

Head and Neck Lipomas, whether intracranial or extracranial are uncommon benign entities that rarely have any sequelae. The typical imaging appearances, anatomical locations and associated findings have been described giving the reader confidence in making this diagnosis.

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