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A Review of the Diagnosis of Forehead Swellings – Scrutiny Before Scalpel

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We discuss the different sources and presentations of forehead swellings as a message of great caution to consider all possible differential diagnoses and to investigate appropriately before commencing a management plan or rushing to an excision.

Keywords: Forehead swellings; surgery; differential diagnoses

Abbreviations: CSF: cerebrospinal fluid; OMFS: Oral and Maxillofacial Surgery

Introduction

Forehead swellings involve the expansion or distension of the face in the frontal forehead region, and therefore can cause patients considerable aesthetic and psychosocial concerns. Long-standing forehead swellings are rare, and diagnosis can often be a source of uncertainty for the clinician [1]. There are a variety of different pathologies causing such presentations, with the origins ranging from the skin (epidermis and dermis), soft tissues (adipose tissue and muscle), frontal sinuses, and frontal bone. We discuss the different sources and presentations of forehead swellings as a message of great caution to consider all possible differential diagnoses and to investigate appropriately before commencing a management plan.

Discussion**Epidermoid Cyst**

Both epidermoid and dermoid cysts are benign swellings commonly found on the scalp, trunk, face and back, with 7% of all epidermoid and dermoid cysts presenting in the head and neck region

[2]. Epidermoid cysts are typically harmless, round to oval masses with a stratified squamous epithelium wall. These fluid-filled protrusions originate from the follicular infundibulum under the skin surface. In terms of aetiology, most epidermoid cysts are sporadic, although familial inheritance should also be considered (particularly in patients with multiple lesions) [3]. They are generally slow-growing compressible, non-fluctuant masses up to several centimetres in diameter, and may form at any age (however, are more typical in the third and fourth decade) [3, 4]. Although epidermoid cysts are ordinarily asymptomatic, they can often rupture to release a yellow fluid through a centralised punctum, which may present with associated pain and erythema [3]. Patients may report tenderness of the lesion, and discharge from the area. Evaluation of epidermoid cysts is achieved through a combination of history and clinical findings, and later confirmed by histopathological analysis of the specimen following excision [4]. Radiographic examination is uncommon in the evaluation of epidermoid cysts, however, ultrasound imaging is occasionally used to visualise larger soft-tissue

masses. In cases with a non-specific appearance, further imaging in the form of magnetic resonance imaging and computerised tomography could also be considered [3].

Dermoid Cyst

Shareef and Etefagh (2021) described dermoid cysts as benign, congenital anomalies caused by the entrapment of ectodermal elements along the lines of embryonic closure. They commonly present within the first year of life and can account for up to 58.5% of all scalp masses in paediatric patients [5]. Unlike epidermoid cysts, a true dermoid cyst contains keratinisation and dermal adnexal structures within the cyst wall (such as hair follicles and sebaceous glands) [6]. These cysts typically present on the eyebrow and frontal region as pale, non-compressible, dome-shaped, firm nodules [7]. Smaller, slow-growing dermoid cysts can remain stable after many years, and ultrasound imaging may be used to reveal a well-defined homogenous and hypoechoic cystic lesion. Due to the possibility for cystic growth over time, with potential consequences of bony deformities or intracranial or intra-spinal expansion, a complete surgical excision is recommended and may warrant computerised tomography and magnetic resonance imaging respectively.

Lipomas

A widely accepted cause of forehead swellings described in the literature are lipomas. These are benign tumours of the adipose tissue with unknown aetiology [8] and are often found deep to the frontalis muscle [9] but may also be intra-muscular [10], between the muscle and deep fascia [11] and between the deep fascia and periosteum overlying the frontal bone [12]. Lipomas are typically slow-growing, soft, non-tender and present as a solitary lesion, with few symptoms aside from aesthetic concerns from the patient. Diagnosis of these lesions is established from the history, clinical examination and ultrasound imaging. However, magnetic resonance imaging and computerised tomography are also reported to be favourable for larger, non-mobile lesions [8].

Osteomas

Slow-growing, benign osteogenic lesions, known as osteomas, are another differential to consider, and are characterised by the proliferation of cancellous or compact bone [13]. Osteomas are frequently associated with paranasal sinuses, most commonly the frontal sinuses [14] in up to 80% of cases [15], and therefore regularly present clinically as a lump on the forehead. The aetiology is unknown and these indolent growths are slow-growing, typically unilateral, and are commonly identified as incidental radiographic findings [14]. The patients' presenting complaint from an osteoma related to the frontal sinuses may be of an asymptomatic mass or lump on the forehead. Diagnosis is achieved from lateral cephalometric and lateral skull radiographs, or computerised tomography. Radiographically these growths may be sessile or pedunculated, mushroom-shaped and diameters range from 1.5mm to 40mm [14].

Pott's Puffy Tumour

Osteomyelitis of the frontal bone subsequent to frontal sinusitis with a purulent collection underlying the periosteum is known as Pott's puffy tumour [16]. Although the nomenclature includes the word 'tumour', there is no underlying neoplasia [17]. This rare but

significant differential has been recorded secondary to trauma to the area, including assault or contact sport injuries, and also following insect bites. The subperiosteal abscess typically presents clinically as a tender and 'puffy' swelling in the forehead region, with potential periorbital swelling and purulent rhinorrhoea. Patients may complain of associated headaches, fever, vomiting, swelling around the eyes and nasal discharge [18]. The rarity of this condition is thought to be the culprit for delays in diagnosis, however swift diagnosis is critical in the prevention of neurological complications through early management [19]. The gold standard for diagnosis is computerised tomography or magnetic resonance imaging [18].

Post-Traumatic CSF Leakage

Post-traumatic leakage of cerebrospinal fluid (CSF) complicates 2% of all cases of head trauma [20]. Fractures of the frontal and ethmoidal sinuses and the temporal bone have the highest incidence of CSF leakage [21]. The majority of CSF leaks will spontaneously resolve within 24-48 hours post-injury, therefore only persistent leaks that develop into a CSF fistula become a cause of management concerns [20]. The sequelae of a CSF fistula include postural headaches, pneumocephalus and bacterial meningitis (the latter of which develops in up to 30% of patients with CSF leakage following trauma). Patients may present with a history of trauma, associated headaches and post-traumatic defects, with or without symptoms of meningitis [20]. Diagnosis may be confirmed through the use of computerised tomography coupled with the clinical presentation and history.

Meningocele

Another intracranial lesion to consider in the differential diagnoses of forehead swellings is a meningocele. This may be an acquired or congenital defect in the cranium and dura resulting in the leakage of cerebrospinal fluid, which can then develop into a fistula [22]. In the frontal bone region, these may present clinically as a soft forehead swelling and recurrent meningitis, with a potential history of trauma to the head. A "reservoir sign" is an idiosyncratic feature of a CSF fistula, where the CSF will accumulate in the sinus whilst the patient is upright and remains there until the patient leans forward. Patients with meningoceles can also complain of headaches and vomiting [22]. The appropriate radiological diagnostic techniques include magnetic resonance imaging and computerised tomography to visualise the fistula and origin of the CSF leak. CSF leaks may also be confirmed through the presence of beta-2-transferrin in the fluid collected if an aspirate is obtained during surgical management [23].

We quote an example of a patient referred to Oral and Maxillo-facial Surgery with a 10-year history of swelling to the right forehead on bending forwards. There was no history of trauma to the area and the patient was fit, well, and on no regular medications. There was, however, a family history of a parent and siblings with lipomas. On clinical examination, there was a non-tender 1.5cm width x 1cm length mild depression at the right forehead. On bending forward, a 1.5x1cm soft swelling developed in the area of the depression. An ultrasound scan and report demonstrated the presence of a well-defined convexity overlying the periosteum of the right frontal bone with thin septations and no internal vascularity and indicated

that the appearance was suggestive of a lipoma. In light of these findings, this patient was referred to OMFS for surgical excision. The clinical findings were not consistent with the typical presentation of a lipoma (a slow-growing fatty mass), in turn giving us cause to consider other diagnoses. We contemplated advice from our Radiology colleagues on appropriate further investigations owing to our clinical concerns. The Radiology Consultant advocated the use of magnetic resonance imaging and computerised tomography to facilitate supplementary analysis of the swelling. This imaging revealed a thin CSF communication tract to the right frontal scalp through the frontal bone and identified scalloping of the right frontal bone. These findings gave rise to differential diagnoses of arachnoid granulation or an arachnoid cyst causing an extracalvarial meningocele.

While the “reservoir sign” was observed on initial presentation to OMFS, other classical symptoms of a meningocele from cases in the literature were not displayed in this patient, nor did they have a history of trauma or meningitis. As a result, this particular patient encounter reinforced the importance of the consideration of all differential diagnoses in the assessment and management of forehead swellings before rushing to an excision. A multidisciplinary perspective to aid diagnosis helped to ensure a safe and holistic approach to patient care.

Conclusion

Any swellings of the forehead region should be viewed with a great deal of caution. More sinister pathophysiological causes should always be considered before any surgical intervention takes place. Correct diagnosis through a combination of history, clinical findings and appropriate radiological modalities is essential to avoid perilous management of forehead swellings.

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Conflicts of Interest

None.

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