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BRIEF COMMUNICATION

Proposal for Staging of Inflammatory Lesions in the Frontal Region☆

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Abstract Frontal swelling can be due to multiple etiologies, including: mucocele, Pott's puffy tumour, fibro osseous lesions, benign, and malignant neoplasms of the nose and paranasal sinuses, intracranial lesions, and metastasis. The objective of this study was to describe the clinical protocol used for the diagnosis of patients presented with frontal swelling and the proposal for staging of inflammatory lesions. We performed an observational retrospective analysis. We found 7 cases of patients with frontal swelling: Four cases secondary to inflammatory pathology (Three Potts puffy tumours and one frontal mucocele), and 3 cases secondary to neoplasms (one benign and 2 malignant neoplasms). It is very important to consider the wide differential diagnosis that can present as frontal swelling, from inflammatory pathologies secondary to possible advanced infections of the paranasal sinuses to invasive malignant neoplasms. We propose a system of staging of frontal inflammatory lesions.

PALABRAS CLAVE
Seno frontal;
Sinusitis frontal;
Tumour de Pott-Puffy

Propuesta de estadificación de las lesiones inflamatorias de la región frontal

Resumen El aumento de volumen en la región frontal puede deberse a múltiples etiologías, dentro de las cuales deben considerarse: mucocele, tumour de Pott-Puffy, lesiones fibro-óseas, tumores de nariz y senos paranasales, lesiones intracraneales y metástasis. El objetivo del estudio fue describir el protocolo clínico empleado en los pacientes que se presentaron con

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aumento de volumen frontal y una propuesta de estadificación de las lesiones inflamatorias. Se realizó un estudio retrospectivo observacional. Se encontraron 7 casos con aumento de volumen en la región frontal: 4 casos secundarios a enfermedad inflamatoria (3 casos tumour de Pott-Puffy, un mucocele frontal) y 3 por neoplasia (un caso benigno y 2 malignos). Es muy importante considerar, entre los diagnósticos diferenciales de aumento de volumen en la región frontal, enfermedades inflamatorias que pueden representar una complicación grave de infecciones nasosinusales o neoplasias malignas avanzadas. Se propone un sistema de estadificación de las lesiones inflamatorias frontales.

Introduction and Objectives

There are many aetiologies that can cause an increase in volume in the frontal region: mucocele, Pott's puffy tumour, fibro-osseous lesions, soft tissue tumours, nose and paranasal sinus lesions, intracranial lesions and, rarely, metastases.

Frontal Mucocele

Formed by the continuous accumulation of secretions inside an obstructed paranasal sinus. These are expansive lesions which cause displacement of adjacent structures. More than 80% of mucoceles originate in the frontal sinus or the ethmoidal cells.[1] Most patients present with visual symptoms, such as unilateral proptosis, diplopia, altered visual acuity, an increase in palpable volume or a palpable superonasal mass. There are few case reports of their presenting as an increase in frontal region volume.[2–5]

Pneumosinus Dilatans

A rare condition characterized by the benign expansion of a sinus beyond the normal limits of the bone. The most accepted hypothesis on its pathogenesis is the formation of a one-way valve. Most cases are asymptomatic and are diagnosed when a deformity presents, such as an increase in volume in the frontal region.[6,7]

Pott's Puffy Tumour

Defined as a subperiosteal abscess of the frontal bone and osteomyelitis secondary to a frontal sinusitis or cranial trauma. It is predominantly found in children. It is associated with intracranial complications such as subdural empyema, cerebral abscess, epidural abscess and venous thrombosis, which are rare in adult patients. In children, intracranial complications present in 60–85% of cases, and in adults, 29%.[8] Clinical symptoms present as headache, fever, rhinorrhea and increased frontal volume. The most common current organisms are Streptococcus, Staphylococcus and anaerobic bacteria, therefore intravenous broad-spectrum antibiotics over 4–6 weeks should be administered.[9] The surgical approach is generally functional endoscopic surgery to drain the frontal sinus and remove the infected bone. In the event of intracranial complications, a cranial approach is made in combination with the neurosurgical department. There is a 9.7% recurrence rate.[8]

Osteoma

A benign bone lesion characterized by a proliferation of bone. It is most commonly found in the frontal sinus (incidence of 37–80%). There are isolated cases of osteomas in the frontal region which present as an increase in volume.[10]

Metastatic Tumours

Brain and frontal bone metastases are most commonly from malignancies of the lung, breast, prostate and rarely the thyroid.[11]

Tumours of the Nose and Paranasal Sinuses

The most common benign epithelial tumour of the nose and paranasal sinuses is inverted nasal papilloma. Squamous carcinoma, undifferentiated carcinoma, esthesioneuroblastoma and adenoid cystic carcinoma should be considered amongst the malignant neoplasms of the nose and paranasal sinuses.[12]

Because it is so rare and given the variety of possible diseases, a standard study protocol has not yet been developed for its diagnosis and treatment.

Objective

To describe the clinical diagnostic protocol used in patients presenting with increased frontal volume and develop a proposal for the staging of inflammatory lesions of the frontal region.

Methods

A retrospective, cross-sectional, observational study was undertaken, evaluating the clinical records of patients who

presented with an increase in volume in the frontal region. The clinical characteristics were evaluated in all the case records (increased frontal volume, nasal endoscopy, comorbidities) and the diagnostic protocol used was reviewed.

Criteria for inclusion: non-traumatic increase in volume in the frontal region, complete clinical record.

Criteria for exclusion: Incomplete clinical records, traumatic aetiology.

Results

Seven cases presented clinically with an increase in volume in the frontal region, with the following diagnoses: 3 Pott's puffy tumours, one frontal mucocele, one fibrous dysplasia, one metastatic papillary carcinoma of the thyroid, one inverted nasal papilloma with malignant transformation. No cases were excluded.

Fifty-seven point seven percent of the cases (4 cases) were inflammatory disease; of these 75% (3 cases) were due to Pott's puffy tumours and 25% (one case) to a frontal sinus mucocele; 14.28% (one case) due to a benign neoplasm (fibrous dysplasia) and 28.57% (2 cases) due to malignant neoplasms (carcinoma papillary carcinoma of the thyroid with metastases to the frontal region, and one inverted nasal papilloma with malignant transformation).

Axial computed tomography was requested for all of the patients (100%), and adjuvant MRI scan in 2 patients (28%). Lesions were discovered by tomography in 100% of the cases secondary to inflammatory and benign neoplastic disease, with no signs of osteolysis. Osteolysis was found in 100% of the cases with malignant neoplasms.

Two cases required medical treatment alone. The majority (5 cases) required surgery, through the external approach with the collaboration of the neurosurgical department.

Three types of inflammatory process were identified which were correlated with their form of treatment and resolution of the process: grade I cellulitis (required medical treatment alone), grade II abscess formation (required external or endoscopic surgical drainage), grade II with intracranial involvement (required a combined neurosurgical approach) (Table 1).

Table 1 Classification of Pott's Puffy Tumours.

Grade	CAT/MRI Findings	Treatment
I	Cellulitis in the frontal region, with no intracranial involvement	Medical
II	Formation of an abscess in the frontal region, dehiscence of the anterior wall of the frontal sinus. No intracranial involvement	Surgical (endoscopic or external approach)
III	Intracranial involvement	Combined neurosurgical approach

Discussion

Cases with inflammatory disease predominated, similar to that reported previously in the literature.[5,8,9]

We classified the Pott's puffy tumours clinically and radiologically, in grade I there was a cellulitis of the frontal region, with no intracranial involvement, the treatment

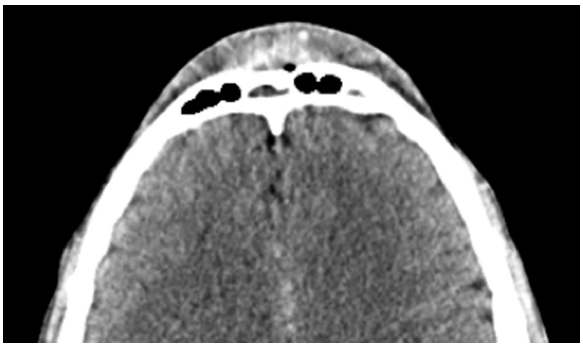

Figure 1 Pott's puffy tumour grade I. Contrast-enhanced tomography of the skull showing cellulitis in the frontal region, with no intracranial involvement. The recommended treatment is intravenous antibiotic therapy alone.

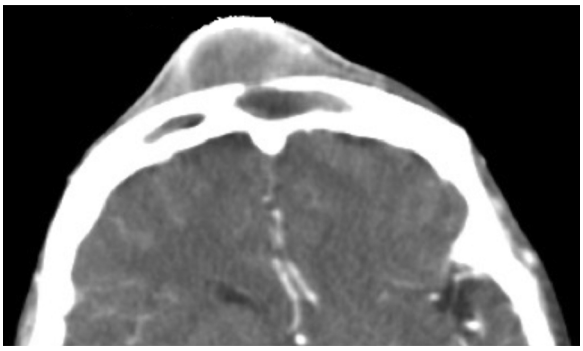

Figure 2 Pott's puffy tumour grade II. Contrast-enhanced tomography of the skull with the formation of an abscess in the frontal region, dehiscence of the anterior wall of the frontal sinus. With no intracranial involvement. The recommended treatment is surgery (endoscopic or external).

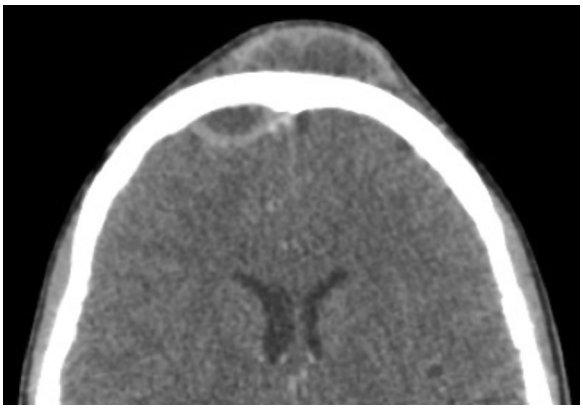

Figure 3 Pott's puffy tumour grade III. Contrast-enhanced tomography of the skull showing intracranial involvement. The recommended treatment is combined neurosurgical.

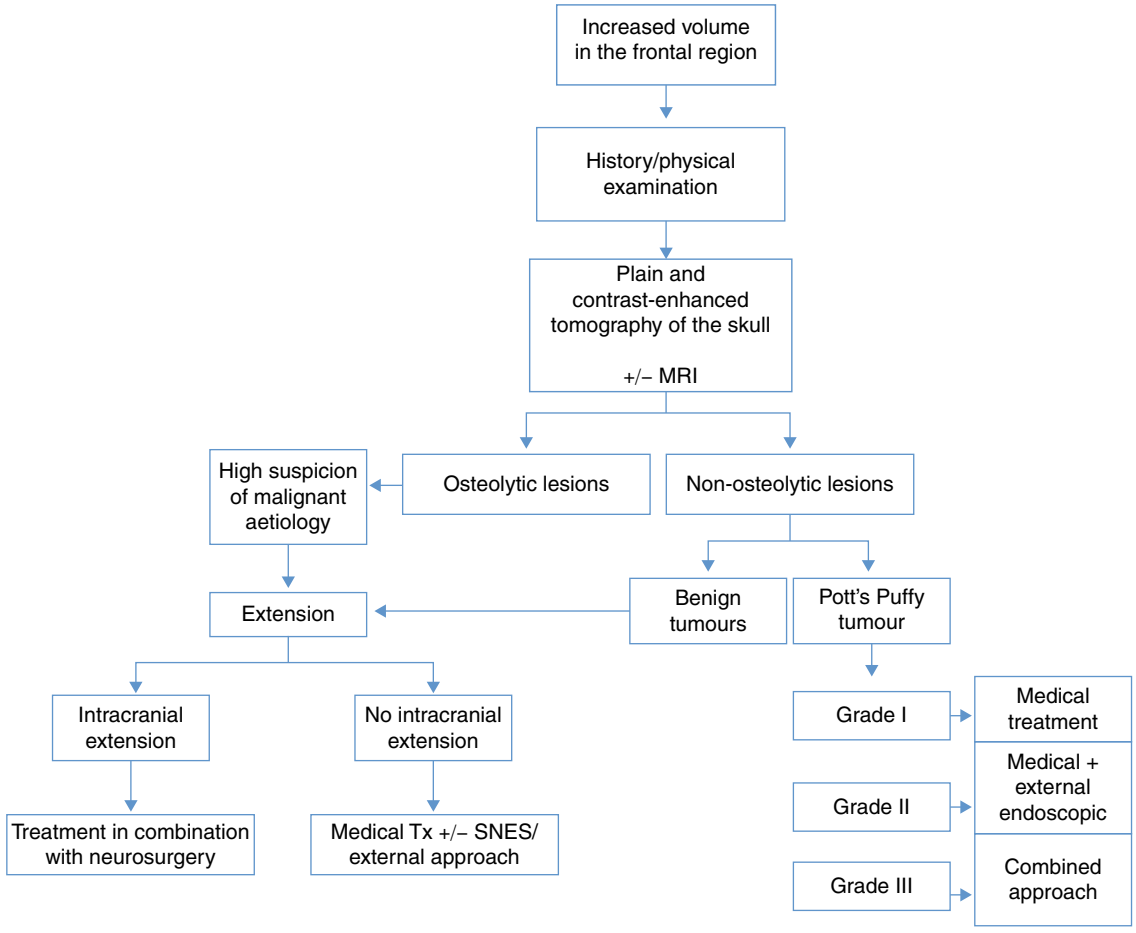

Figure 4 Diagnostic algorithm for increased volume in the frontal region. SNES: Sinonasal endoscopic surgery.

was medical alone (Fig. 1). Grade II was the formation of an abscess in the frontal region with dehiscence of the anterior wall of the frontal sinus with no intracranial involvement; the treatment had to be external surgery to drain the abscess in the frontal region with or without an endoscopic approach (Fig. 2). In grade III there was intracranial involvement and the approach had to be in combination with the neurosurgical department (Fig. 3).

We highlight among these cases the thyroid metastasis which is very rare in this location, although known to metastasize to bone.[10]

It is important to ask the right background questions to consider possible differential diagnoses and undertake a full physical examination to establish whether there is orbital or intracranial space involvement.[11–14]

Axial computed tomography of the skull is the basic imaging study when approaching an increase in frontal volume, to establish its origin and its extension to other structures such as the orbit and intracranial cavity.[3,5]

The presence of osteolytic lesions is highlighted in the malignant neoplasms, and invasion into the intracranial space and orbit.[12]

This study is important in raising awareness of the diversity of differential diagnoses which should be taken into account in a patient presenting with increased volume in the frontal region. These include inflammatory causes, benign neoplasms and malignant neoplasms.[3]

Conclusions

There is no information in the medical literature on the differential diagnosis and diagnostic approach for frontal masses.

Amongst the differential diagnoses, it is very important to consider inflammatory diseases which can entail serious complications of sinus infections and malignant neoplasms, which reflect advanced disease.

Given the diversity of diagnoses, an appropriate diagnostic protocol should be developed that includes sinonasal endoscopy to determine the aetiology, and to establish the correct treatment.

Unlike with other masses in other locations, an incisional biopsy is not indicated in the first instance.

Imaging studies, principally contrast-enhanced axial computed tomography and in some cases MRI head scan, are essential in determining the extension of underlying disease, whether or not there is intracranial involvement, and whether or not there are lytic lesions which might help to differentiate malignant from benign tumours.

Most of these diseases require surgical treatment, many with external approaches and frequently in collaboration with neurosurgery.

We propose a system for staging inflammatory lesions in the frontal region (Table 1) and a diagnostic algorithm (Fig. 4).

Conflict of Interest

The authors declare no conflict of interest.

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