BRIEF COMMUNICATION

Combined Approach for the Treatment of Spontaneous Temporal Encephaloceles: Transmastoid Plus Temporal Minicranietomy☆

Julio Rama-López,* Rosana Rodríguez-Villalba, Pedro Sarria-Echegaray, Manuel Tomás-Barberán

Servicio de Otorrinolaringología, Sección de Otoneurología, Hospital Universitario Son Espases, Palma de Mallorca, Islas Baleares, Spain

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Cerebrospinal fluid leak; Encephalocele; Minicraniotomy; Transmastoid; CSF otorrhea

Abstract  Spontaneous encephaloceles are defined as brain herniations with no apparent cause. The aim of this paper is to describe the surgical technique performed in our department. We reviewed the last 3 cases treated with combined approach (transmastoid plus minicranietomy) with 2-layer closure. In all cases the bone defects were located and successfully sealed. We had no postoperative complications. There were no relapses in our follow-up period. The transmastoid approach has the advantage over the open approach with middle fossa craniotomy in that it locates the bone defect with no brain retraction. Nevertheless, it is not useful in large-sized, multiple or anterior defects. Due to those drawbacks, we think that the combined approach with temporal minicranietomy is the best choice for this entity.

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Abordaje combinado para el tratamiento de los encefaloceles temporales espontáneos: mastoidectomía + minicranietomía

Resumen  Los encefaloceles espontáneos son aquellos en los que no se puede determinar un origen. El objetivo del trabajo consiste en describir el tratamiento quirúrgico empleado. Presentamos los 3 últimos casos tratados mediante abordaje combinado transmastoideo y minicranietomía, y cierre con cartílagos y pericondrio conchal. En todos los casos se pudo acometer una correcta localización del encefalocele con un adecuado sellado del defecto óseo. No existieron complicaciones postoperatorias. No existieron recidivas en el periodo de seguimiento.

* Corresponding author.
E-mail address: julioramalopec@hotmail.com (J. Rama-López).

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Introduction

An encephalocele is defined as the presence of brain tissue outside the cranial structures.\textsuperscript{1} This is a rare disease with an approximate incidence of 1:35 000 cases. Temporary encephaloceles involve the herniation of the meninges and/or brain tissue inside the temporal bone including the petrous apex, tegmen tympani and the mastoids.\textsuperscript{2} Depending on the type of herniated tissue a distinction must be made between meningoceles (herniation of the meninges only), meningoencephaloceles (meninges and brain tissue) and encephaloceles (brain tissue only).

They are classified as acquired and spontaneous. Spontaneous encephaloceles, which are the focus of this publication, are those for which no traumatic, neoplastic, inflammatory or iatrogenic origin can be found, and they represent approximately 20\% of the total,\textsuperscript{3,4} and they can be multiple. Over the years various physio-pathological mechanisms have been highlighted to explain their origin, although in these spontaneous cases they appear to be associated with benign intracranial hypertension.\textsuperscript{5-8}

Clinically they can manifest as symptoms of persistent serous otitis media, conductive hearing loss, otoliquorrhoea or neurological symptoms such as epilepsy (due to irritation of the herniated brain tissue), headache, aphasia (due to the temporal area being affected) or alterations to the facial nerve (due to compression of the nerve or possible associated malformations).\textsuperscript{3,6,9-11}

The object of this paper is to describe the surgical treatment used in the therapeutic approach to the last three cases treated in our department: a combined transmastoid approach, performing a temporal minicraniotomy to control an existing defect. The procedure is not the most commonly used to approach this disease; however it was our approach of choice for the treatment of meningo-encephaloceles as we consider that it is not excessively complex and enables excellent control of these lesions.

Methods

The three cases covered involve three women aged between 45 and 67 years of age.

They had no relevant clinical history of interest, or a history of additional otoneurological disease.

They presented with a watery discharge over several months, two of the patients had undergone the placement of trans tympanic ventilation tubes. The third case was referred to our department from a different centre as she presented with pneumococcal meningitis, as she had a persistent headache and fever spikes despite appropriate medical treatment.

A preoperative study was performed on the three cases and high resolution CAT and MR imaging (Fig. 1).

In the first two cases, the bone defect had occurred only in the area of the mastoid antrum, whereas in the third case it was broader and extended from the antrum to the tympanic membrane anteriorly beyond the head of the malleus. Therefore the possibility of having to perform an excision of the ossicular chain with subsequent reconstruction had already been considered preoperatively.

A combined approach was used in the three cases performing a mastoidectomy and minicraniotomy and monitoring of the facial nerve. The procedure started using a classical retroauricular approach widening the incision to the temporal area. Firstly, a simple mastoidectomy was performed until the mastoid antrum was reached and the meningoencephalic herniation located. In the third case it was necessary to undertake a radical mastoidectomy as the herniation extended to the tympanic membrane.

Subsequently we proceeded to reduce the meningoencephalic tumour using bipolar cauterisation up to the edges...
of the bone defect (Fig. 1). Until checking that was possible to effect adequate reduction of the meningoencephalic herniation.

Once the mastoid approach had been realised we performed a temporal minicraniotomy with subperiostial dissection of the temporal muscle. Then a craniotomy was performed by reaming just about 2 mm above the temporal line of about 2.3 cm of crown-rump length which extends up to the rearmost aspect of the zygomatic arch (Fig. 2). Using a small, pliable spatula it was possible to lightly retract the temporal lobe until the defect could be seen at the base of the skull connected with the mastoids (Fig. 3).

We used conchal and perichondrium cartilage to close the defect stabilised with Gelita® type absorbable material. In the third case we reconstructed the cavity with palisade cartilage and placed a total plate-retained prosthesis. The retroauricular incision was closed by planes and a capeline-type bandage applied and maintained for 24–48 h.

In the post-operative period the recommendations were followed to prevent an increase in intracranial pressure, such as continued bed rest with elevated head for 72 h, treatment with acetazolamide, corticoids and laxatives. A lumber drain was not placed in any of the patients.

Results

By using this approach it was possible for the defect to be displayed appropriately and to reduce the meningoencephalic herniation without incurring problems.

Cauterising a small amount of brain tissue in the affected temporal area did not cause neurological sequelae in our series.

There were no intraoperative complications.

In the subsequent follow-up there were no otoneurological complications, the otoliquorrhoea ceased and the third patient no longer had headache and fever.

During follow-up of the patients, which was 34 months in the first case, 18 months in the second and 8 months in the third, no relapse of the encephalocele was observed and they remained asymptomatic. The patient who underwent the radical mastoidectomy continued to have low-grade conductive hearing loss.

Discussion

Spontaneous fistulas of cerebrospinal fluid should be suspected in cases of unilateral serous otitis media which is resistant to treatment. Therefore although these cases are not common, otoliquorrhoea should be included in the differential diagnosis of all middle ear effusions which persist even though appropriate treatment has been given.

Several studies show a significant association between spontaneous fistulas with or without encephalocele and the female gender. They generally affect women of middle or advanced age, who are overweight and present with progressive hearing loss with a sensation of fullness in the ear, as was the case with the three patients presented. Meningitis is the presenting symptom in 18%–25% of cases, as with our third patient.

These spontaneous encephaloceles need to be treated surgically even if the presence of herniated tissue is not observed and the only manifestation is a CSF fistula, because there is a high risk of presenting with meningitis during their evolution (9%–50% of cases).

The choice of the best approach for this type of lesion is down to the subjectivity of the surgeon involved as there are no comparative studies on the evolution of cases treated using a particular approach. The chosen approach should comply with several aspects such as: (1) appropriately identifying the limits of the bone defect producing the meningoencephalic herniation; (2) it being possible to correctly and sufficiently reduce the herniated tissue; (3) enabling the defect to be appropriately closed using the chosen reconstruction and a good check of the seal and (4) being able to reconstruct the middle ear if necessary, during the same surgical time.
These four aspects can only be achieved using a combined approach.11

The advantage of the transmastoid approach is that it enables the defect in the base of the skull to be located without causing neurological morbidity as it avoids brain tissue retraction. We, as specialists in otolaryngology, are very familiar with this approach. However, especially in large defects or those in a more anterior location, it does not enable the bone defect to be correctly sealed and/or the appropriate control of the entire volume of herniated tissue. We consider that these limitations constitute a good indication for combining the transmastoid approach with performing a minicraniotomy.12 This is an approach which is easy to realise, has adds hardly any morbidity and, in our experience does not present neurological complications. It also allows excellent visualisation of the defect; all this without the possible morbidity and increased surgery time which can occur with the traditional middle fossa or subtemporal approaches. No significant differences have been described with regard to choice of approach in broader case series, but this could be because these are series in which different approaches are mixed. It does appear that there is a lower recurrence rate of meningoencephaloceles using combined approaches. For this reason and because of its low morbidity, we have chosen to use this approach for the treatment of encephaloceles.

There are different options as to which material to use for closure, and all of them give good results. Cortical bone, septal or auricular cartilage, fascia lata, temporal muscle, etc. are used.2,13 However, no reconstruction has been able to demonstrate a better success rate for any particular material over another. It is generally accepted that the seal should be made using a "multilayer" technique as this presents a higher sealing rate, combining various materials,9,15 and that securing materials or biological glues by suturing sutures does not appear to offer any significant advantages.9

**Conflict of Interest**

The authors declare no conflict of interest.

**References**