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INTRACRANIAL ABSCESSES IN INFANCY AND CHILDHOOD

REPORT OF 40 CASES

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Brain abscesses are found in all age groups, remain many times asymptomatic for weeks or months and cause, later, severe symptoms with a serious prognosis. Their course may be even more devastating in infancy and childhood due to the impossibility or difficulty those patients have to express their complaints, to the non-perception of the signs by the parents and also to the greater compliance of the cranial structures. These three characteristics allow a greater progress of the disease in such a way that when it is diagnosed the stage is too severe. Thus, it is important to be able to recognize the manifestations in that age group in order to establish an early diagnosis and prompt treatment.

This study aims to evaluate the cases of brain abscesses admitted between 1961 and 1982 and presents several aspects of the history-taking, clinical and neurological examinations, laboratory tests, treatment and prognosis.

MATERIAL AND METHODS

The records of 40 patients (21 boys and 19 girls) under 15 years of age, admitted to the Section of Child Neurology in the past 21 years were studied. The group comprised all the cases of brain abscesses admitted in that period. In all cases but one the diagnosis was confirmed by surgery or necropsy. In one patient the diagnosis was established only by computerized tomography (CT) scanning. Those patients who developed abscesses after surgery in the nervous system were excluded from this study.

Study performed at the Department of Neuropsychiatry "Hospital das Clínicas" — University of São Paulo School of Medicine: * Resident Physician; ** Associate Physician; *** Head of Pediatric Neurology Section.

RESULTS

The number of patients admitted for that disease decreased progressively. In equal periods of 5 years the number of cases were: 15 (1961-1965); 8 (1966-1970); 9 (1971-1975); 4 (1976-1980). Only three cases were observed in 1981 and 1982. The age groups of the patients were: 13 cases under 5 years old; 16 cases between 6 and 10 years old; 11 cases between 11 and 14 years old. In the first year of life the cases were detected equaly in the first and in the last semester. There was a predominance of 30 cases of white patients; the other were negroes (8 cases) and non-white (2 cases). The initial most frequent symptoms were intracranial hypertension in 31 cases characterized by headaches and vomiting. In the 7 infants under 2 years of age an increase in the head circumference was reported in 5 patients. Fever was the second most common sign and was observed in 25 children; 22 cases showed alterations of consciousness like prostration, stupor or coma of slow onset; restlessness was described in only 3 cases. Seizures were noticed in 18 patients. Signs of localization, usually hemiparesis occurred in 13 children according to their parents' reports. Anorexia was described as a marked initial symptom in only 2 patients. In many cases several of these manifestations started at the same time in the clinical picture. The time elapsed between the initial symptoms and the diagnosis was: less than a month in 19 cases; 1 to 6 months in 20 cases; 12 months in one case.

The primary site of infection could be found in 23 patients. Acute or chronic otitis media was responsible in 7 cases; sinusitis and facial abscess, 3 cases each; chronic pulmonary disease and ostemyelitis, 2 cases each; dental abscess, pyoarthritis, meningitis, mastoiditis, nasal acne and traumatic lesion of the scalp, one case each. Congenital cardiopathy was found in 6 patients and pulmonary arteriovenous fistula in only one. At the time of admission only 5 children presented normal clinical examinations; the others revealed weight loss, toxemia or only the presence of infectious foci or congenital cardiopathies. Ne rologic examination revealed macrocephaly in 6 of the 8 children under 2 years of age. Paresis were the most frequent findings: they occurred in 20 cases; meningeal signs in 18 cases; involvement of cranial nerves in 13 cases: the 6th was the most common and found in 9 cases, followed by the 3rd in 3 cases, and the 7th in only one case. Ataxia was reported in 3 cases. Optical fundi examination showed bilateral papilledema in 17 cases and unilateral in only one patient.

Complete blood counts were performed in 29 children and evidenced leukocytosis in 22 with neutrophilia in most of them. Erythrocyte sedimentation rate measured in 8 patients was elevated in 7. Cerebrospinal fluid (CSF) was analyzed in 29 cases. The pressure was normal in 54.5% and elevated in all the others. Celiularity was in normal levels in 44.8%; 5 to 10 cells in 13.7%; 10 to 50 cells in 31.0%; 50 to 100 cells in 10.3%. In all cases lymphomononuclears predominated. The protein rate was below 20 mg% in 19.2%; 20 to 40 mg% in 30.7%; 40 to 100 mg% 15.3%; 3.8% showed a level above 200 mg%. Glycorrhachia was normal in 94% and elevated in the remaining 6%. Electroencephalogram (EEG) was performed in 28 patients and was normal in only one. In 23 cases there was coherence between the lateralization of the abnormal tracing and the localization of the abscess. In general, there were slow waves in the affected areas.

In 4 cases there was no lateralization and all these were cerebellar; two showed signs of desorganization of suffering in bilateral occipital areas; one revealed frontal central delta waves; one evidenced diffuse slowing.

Isotope scan performed in only three cases supplied a correct diagnosis of localization in all of them. The least used neuroradiologic exam was ventriculography, performed in only two cases; both evidenced the correct localization. Angiography was carried out in 34 cases and showed the localization in 29. In the other 5 patients angiography either evidenced only ventricular dilatation or was normal. CT scanning performed in 3 cases established the correct diagnosis in all of them.

The localization of the abscess was predominantly frontal in 40.0%; parietal in 42.5%; temporal in 10.0%; cerebellar in 10%; pontine in 2.5%. In 5% it was extensive with fronto-temporo-parietal involvement (Table 1). Among the ones that had otitis as the primary focus, the most common localization were temporal and cerebellar. Those patients who presented sinusitis as starting focus were frontal and parietal. Among the ones originated from abscesses in the face, there were predominantly pontine and

Localization	Number of cases	Number of deaths
Frontal	16	4
Parietal	12	7
Temporal	4	1
Cerebellar	4	2
Extensive *	3	1
Pontine	1	1
Total	40	17

*Table 1 — Predominant localization and number of deaths due to brain abscesses in 40 patients under 15 years of age. * Extensive = fronto-temporo-parietal.*

Foci	F	P	T	C	Po	E
Otitis		1	3	3		
Sinusitis	2	1				
Facial abscess	2			1		
Osteomyelitis	1	1				
CPD	1	1				
Others	4	3				
ND	6	5	1		1	1

Table 2 — Predominant localization of 40 brain abscesses in relation to the primary foci. Patients under 15 years of age. CPD = chronic pulmonary disease; ND = non detected; F = frontal; P = parietal; T = temporal; C = cerebellum; Po = pons; E = extensive (fronto-temporo-parietal).

cerebellar (Table 2). The small number of the other primary foci did not permit to establish relationship of localization. Half of the 6 patients with congenital cardiopathies presented frontal involvement and the other half was parietal. The most common germs isolated from the abscesses in 24 patients were *Staphylococcus aureus* and *Streptococcus viridans* (Table 3). In 5 children there was more than one infecting agent. Among the *Streptococci*, 3 cases were *viridans*, 2 cases of *pneumoniae*, 2 cases of *peptoestreptococcus*, one case of *sanguis* and in one case the species was not defined.

	O	S	F	Ost	Others
Staphylococcus sp.	2	2		1	6
Streptococcus sp.	2		1		7
Klebsiella sp.			1		1
Proteus mirabilis					1
Escherichia coli					1
Alcaligenes faecalis					1
Bacillus subtilis	1				
Bacteroides fragilis					1
Fusobacterium sp.					1

Table 3 — Germs isolated from brain abscesses in relation to primary foci. Casuistics of 24 patients under 15 years of age. Others = other foci or non-detected focus; O = otitis; S = sinusitis; F = facial abscess; Ost. = osteomyelitis.

Surgical treatment was performed in 34 patients. In 5 cases there was no surgery either because the patients died before, or due to a misdiagnosis while they were alive. In only one case the treatment was only clinical because a small abscess was detected through CT scanning and it subsided with systemic antibiotic therapy. Among the forms of surgery used, 16 cases were puncture and aspiration or drainage either through the fontanelle or after trepanation. The other 18 underwent craniotomy with withdrawal of the abscess. In 5 of these last cases either puncture and aspiration or drainage were performed and then, a craniotomy was necessary. All the 40 patients were administered systemic antibiotic therapy which varied during the two decades of this study.

The prognosis, among the 34 patients submitted to surgical treatment was poor with a mortality rate of 35.2%. In the ones submitted to puncture and aspiration the mortality was 37.2%; in those submitted only to craniotomy with withdrawal of the abscess, 36.3%, in the ones submitted to both forms of treatment, 28.5%. In the total of 40 patients, the supratentorial abscesses led to death in 40% and the infratentorial ones in 60%. Among the ones who underwent surgery, the supratentorial abscesses had a mortality of 29.7% and the infratentorial ones of 33.3%. Among the 5 patients not submitted to surgery, 2 had supratentorial and 3 had infratentorial localizations. The level of consciousness at the time of admission to the hospital was not an important factor in the prognosis since 43.4% of the ones admitted with disorders of consciousness

died while 41.1% of the others had such prognosis. Mortality rate among the 40 patients evaluated was 60.0% in the period between 1961 and 1965; 50% from 1966 to 1970; 22.2% from 1971 to 1975; 25.0% from 1976 to 1980. In 1981 and 1982 three cases were admitted and only one died.

COMMENTS

There was a progressive decrease in the number of patients with this disease during the two decades analyzed. Our data are according to Wright & Grimaldi [21] who reported progressive decrease of brain abscesses secondary to otologic diseases from 1938 to 1971. Perhaps this decrease is due to more wide use of antibiotics, thus eliminating potential primary foci. On the other hand, Newlands [19] reviewing cases from 1953 to 1962, Morgan & col. [16] with cases between 1946 and 1971, and Garfield [8] with cases from 1951 to 1967 report that they did not observe decrease of admissions of the disease. Several authors report that this illness may occur in any age group [2,3,4]. Our findings did not show a clear predominance in any of the ages analyzed. The similar involvement that we found in both sexes do not agree with reports of other publications which mention the possibility of a predominance of males [1,2,3,4,15,18].

Intracranial hypertension, fever, disorders of consciousness, seizures and signs of localization as well as meningism and convulsions were the principal manifestations in our cases. These findings are in accordance with a great number of publications [2,3,4,7,16,18,19]. The absence of fever is a main characteristic in the first months of life [9], and the increase of the head circumference is an important datum in infants [9], which were also found in our sampling. In about half of our cases the involvement was subacute and took less than a month before the diagnosis was established. The period between the first signs and the diagnosis took 1 to 6 months in 20 cases. These findings agree with the ones of Bhatia & col. [3] who reports a history of two months or less in all his patients. Nestadt & col. [18] report, in average, five-week course while Newlands [19] reports an average of 20 days. These data indicate that it would probably be possible to establish the diagnosis earlier, should the possibility of brain abscess occurred more frequently. The primary focus could be evidenced in 57.5% of our cases and the most frequent were otitis, sinusitis and facial abscess. Congenital cardiopathies were detected in 15% of the patients. Other authors also report that the most frequent foci were related to an infection in the sinuses of the face or the ear [1,2,4,5,14,16,18,20]. In one fourth of the patients of Morgan & col. [16] and Brewer & col. [4], in 13.0% of the cases of Nestadt & col. [18], and in 23.3% of the ones of McGreal [14] the primary focus could not be detected.

Leukocytosis with neutrophilia occurred in most blood counts of our patients. Although French & Chou [7] draw the attention for the fact that leukocytes in normal levels do not rule out the possibility of this diagnosis, several authors agree that leukocytosis is found in most cases [9, 18]. Erythrocyte sedimentation rate was elevated in most of our cases which agrees with other publications [7]. CSF with normal cellularity or moderate pleocytosis of lympho-

cytic predominance accompanied by hyperproteinorachia and glucose in normal levels was the most detected picture in our patients. These same findings were reported by other authors [19, 21] in most cases. Brewer & col.[4] report that it is not uncommon the concomitance of purulent meningitis with abscesses, but this fact was not seen in any of our patients. The casuistics observed does not agree with the report of French & Chou [7] who consider the CSF is not consistent and non-reliable in abscesses. We agree with the authors [4, 7, 8, 16] who draw the attention for the danger of performing CSF examinations in these patients due to the intracranial hypertension. EEG proved to be reliable as to the supratentorial localization of the abscesses by supplying the lateralization in 95.8%. The reliability of this evaluation in relation to the lateralization is variable in the literature and is mentioned as 50% [3, 7], 51% [8], 62.5% [19], 90% [4], 93.3% [16].

Isotope scan was useful in localizing the lesion in our casuistics in spite of having been performed in a small number of patients. Freench & col.[7] report that this exam is realy important because it gives the exact localization in about 90% of the cases. Iodineventriculography was performed in only two of our cases, both with abscesses in the posterior fossa. Although this examination had been largely used by other authors in the past [16], its use has recently been discontinued due to the advent of CT scanning. Angiography was able to establish the correct localization in 85.2% of the cases in our sampling. These findings are similar to the ones of French & Chou [7] and Brewer & col.[4] who noticed rates of 90 and 94% respectively. Currently, CT tends to be the first-choice examination due to its harmlessness, facility to be performed and high power of resolution, when compared to the other neuroradiologic evaluations in brain abscesses. In our sampling it was carried out in three patients and established the diagnosis in all of them. These data agree with the other authors who mention CT scanning as an evidence of such lesions in all cases [4].

The localization found in our casuistics was mainly frontal and parietal. Several authors mention the frontal abscesses as the most commonly found [2, 3], although, for others [1, 18] the finding of temporal localization is the most common. Among all the 40 cases analyzed we found 12.5% localized at the posterior fossa. Other publications report this rate as 5.5% [3], 10.6% [7], 10.8% [1], 13.6% [16], 13.9% [12], 18.0% [15], 20.0% [2], 31.2% [19]. Wright & col.[21] state that, whenever the primary focus is otogenic, the most frequent localizations are temporal and cerebellar. Among the infecting agents isolated we noticed a predominance of *Staphylococcus aureus* and *Streptococcus viridans*. Other publications mention *Streptococcus* as the most commonly found [3, 4] and among these mainly the *viridans*, although other authors consider *Staphylococcus* and *Streptococcus* as equally common [1, 8, 10, 18, 19]. In the first months of life, Munslow & col.[17] observed principally *Proteus* and *Pseudomonas*, while Hoffman & col.[9] mention *Paracolon, Proteus* and *Pneumococcus*. Shaw & Russess [20] report that *Proteus mirabilis and Staphylococus aureus* predominate among the ones of cerebellar localization. According to Lerner [13], perhaps the anaerobic germs are respon-

sible for many cases but they fail to be diagnosed because an adequate culture is not frequently performed. This statement may be correct in relation to our sampling since, during these 22 years those cultures were not often performed and, it is well known that these germs are an important cause of chronic infections of the sinuses [6].

Two surgical approaches were used in our cases: puncture with drainage and craniotomy with withdrawal of the abscess in 16 and 18 cases respectively. Our results agree with other publications which report equal mortality with drainage or excision [1, 7]. On the other hand, Le Beau & col.[10] noticed better rates with excision than with aspiration. The mortality of 35.2% among the cases submitted to surgery in our cases lies in the average of the ones reported by the other publications: 17% [4], 18% [7], 25% [1], 27.5% [19], 29.1% [16], 30% [14], 50.0% [3]. Like in our sampling the lethality was related neither to the kind of surgery used nor to the state of consciousness at the time of admission to the hospital; perhaps the decrease observed during that time was due to better pre and post-operative care. We also agree with Bathia & col.[3] and French & Chou [7] who drew the attention to the fact that the bad prognosis is perhaps due to not having in mind the possibility of this diagnosis and to the delay in referring these patients to surgery.

SUMMARY

Forty cases of brain abscesses in patients under 15 years of age observed between 1960 and 1982 are reported in this study. There has been a progressive decrease in the number of admissions due to that disease. The typical clinical picture was subacute and characterized by intracranial hypertension, fever, alterations in the level of consciousness, seizures and signs of localization in a decreasing order of frequency. Otites and sinusites predominated as primary foci and the most common localizations were frontal and parietal. Electroencephalogram and examination of the cerebrospinal fluid were useful. Currently, computerized tomography is indicated as the test of choice. Thirty-four patients underwent surgeries and the mortality rate was 35.2%.

RESUMO

Abscessos intracranianos na infância. Estudo de 40 casos.

São relatados 40 casos de abscessos intracranianos em pacientes abaixo de 15 anos de idade, observados de 1960 a 1982. Houve decréscimo progressivo no número de internações por esta patologia. O quadro clínico típico foi subagudo e caracterizou-se por hipertensão intracraniana, febre, alterações do nível de consciência, convulsões e sinais de localização, em ordem decrescente de freqüência. Otites e sinusites predominavam como focos primários e as localizações mais comuns foram frontais e parietais. Eletrencefalograma e líquido cefalorraquidiano revelaram-se úteis. Atualmente, a tomografia computadorizada é indicada como exame de primeira escolha. Trinta e quatro pacientes foram submetidos à cirurgia, tendo sido a mortalidade de 35,2%.

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