Management of subdural intracranial empyemas should not always require surgery

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SUMMARY Seven patients with subdural empyema were initially treated by antibiotics without surgery. Six have recovered without sequelae. One required delayed surgery and has recovered with epilepsy. The authors emphasise the use of CT for the diagnosis and follow-up of subdural empyema, the principles and modalities of non-surgical treatment, and the good results, especially for late morbidity.

From the medical literature, it is evident that, even when antibiotics became available, most authors have agreed there is need for surgery in all intracranial subdural empyemas.¹⁻³ However, this treatment has not prevented serious mortality^{1,4} and sequelae.^{1,5} Since the use of CT for the diagnosis of various central nervous system suppurations,^{6,7} some authors have treated brain abscesses,^{6,8-10} extradural/intracranial abscesses¹¹ and even spinal epidural abscesses⁷ without surgery. We report here the results obtained with 7 patients with subdural empyema treated without surgery.

Case reports

The first three patients have been the subject of a previous report in a review about clinical and radiological findings in subdural empyemas. The second patient's history is reported in detail, and the six others are summarised in the table. Each patient's CT scan, before and after treatment, is shown in the figs 1-5.

Patient 2

This 19-year-old woman had a 1 week history of fever and bifrontal headache and received each day amoxicilline (1 g orally) for 4 days. She was admitted to the neurological department on 13 April 1982 with fever (38°5), headache and vomiting. She was lethargic, with a left hemiplegia and a palsy of both external recti. Her neck was stiff. Generalized seizures occurred. CSF contained 900 white cells/mm³ (100% polymorphonuclear), protein 0.6 mg/l and glucose 0.6 g/l. ESR was 120 mm/h and WBC count was 15000 (80% polymorphonuclear). CT (fig 2a) revealed an interhemispheric area of low density with an enhanced thin

margin after contrast and compression of cerebral and ventricular structures. No causative organism was isolated from CSF or blood cultures. Skull radiographs showed opacification of the right maxillary and frontal sinuses. The patient was treated by ampicillin (12 g IV), sisomicine (150 mg IM) and trimethoprim-sulfamethoxazole (320 mg-1600 mg IV) for 6 weeks, then by oral amoxicillin 6 g daily for 4 months. Clonazepam (3 mg IV) was added during the first 48 hours and mannitol during the first 5 days. When the treatment was stopped, she had no neurological deficit and CT scan (fig 2b) showed no abnormalities. Thirty months later, she had had no seizure, and did not receive anticonvulsant medication.

Discussion

The use of CT for diagnosis and follow-up

As in brain abscesses,⁶ a non-surgical treatment of subdural empyemas is possible only if CT can be performed. It reveals small empyemas which could not be diagnosed otherwise, as in the second case reported by Rosazza:¹³ this was a patient with purulent meningitis and without any focal deficit, in whom CT showed a small subdural empyema. CT also allows easy and atraumatic follow-up.^{2,14}

The classical treatment of subdural empyemas

For most authors, surgery is always required in all subdural empyemas: they often prefer a large craniotomy^{1,3,15,16} to burr holes, so as to provide purulent material and allow an irrigation of the subdural space with antibiotics.¹⁶ For these authors, the surgical treatment must be performed in emergency, but Pimontel-Appel¹⁴ prefers to wait for an improvement of the neurological state, 24 to 48 hours after the onset of antibiotic therapy. In spite of the possibility of improvement with surgical treatment, the importance of antibiotics cannot be neglected.

The first successfully treated cases occurred only

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Table Cases of non-surgically treated subdural empyemas

Authors	Sex and age (yr)	Clinical signs	CSF			ESR mm/h	WBC/mm ³	CT scan
			Cells	P	G			
Rasazza ¹³	M 14	fever headache left hemiplegia	33	1200	720	?	17400	IH SDE
Rasazza ¹³	M 11	fever meningism left hemiplegia	316	1500	721	?	17300	IH SDE
Rousseaux ²⁰	M 24	fever meningism left hemiplegia	255	?	?	?	?	IH SDE
Case 1 802284	M 29	fever focal seizures generalised status with coma right hemiplegia and aphasia	830	800	500	26	11600	IH SDE left PA SDE (fig 1)
Case 2 820869	F 19	fever generalised seizures left hemiplegia VI palsy meningism	900	600	600	120	15000	IH SDE (fig 2)
Case 3 821121	M 22	fever focal seizures coma right hemiplegia	50	550	700	85	15100	FR SDE (fig 3)
Case 4 830286	M 40	fever generalised seizures right hemiplegia meningism	5	400	800	60	13000	FR SDE (fig 4)
Case 5 831075	M 56	fever generalized status with coma meningism right hemiplegia	50	400	500	100	22000	whole convexity SDE (fig 5)
Case 6 840544	M 15	fever meningism	80	300	500	15	6000	FR SDE (fig 6)
Case 7 841050	F 24	fever focal and generalised seizures with coma meningism aphasia	100	1100	740	80	12000	IH SDE TE SDE (fig 7)

M, male; F, female; P, proteins (mg/l); G, glucose (mg/l); SDE, subdural empyema; IH, interhemispheric; PA, parietal; FR, frontal; TE, temporal; T R, total recovery; Amp, ampicillin; TMP-SMX, trimethoprim-sulfamethoxazole; Siso, sisomicin; Amox, amoxicillin; Metro, metronidazole; PRIS, pristinamycin.

after the introduction of penicillin.¹⁷ More recently, ampicillin and especially chloramphenicol have been preferred, because of their good diffusion into the central nervous system^{13 18} and their effectiveness on anaerobic organisms, which are frequently isolated from subdural empyemas.¹⁸

Why have we tried a non-surgical treatment?

Surgery has usually been performed as an emergency because of two objections to a non-surgical treatment: firstly, antibiotics do not penetrate into loculated intracranial suppurations, and secondly, it is necessary to know the causative organism and its sensibility to

Fig 1 (Patient 1) (a) On admission: interhemispheric and left parietal subdural empyema. (b) After a 30 day course of antibiotics: disappearance of the most part of the empyema, but increase of the posterior part. (c) A year later: no residual empyema.

Point of entry	Organism	Treatment		Clinical outcome
		Antibiotics	Associated medications	
sinusitis	unknown	Ampi Chloramphenicol (3 weeks IV 5 weeks orally)	Dexamethazone	TR
sinusitis	staphylococcus	Ampi IV 6 weeks	sinusitis drainage	TR
sinusitis	unknown	Ampi IV 6 weeks	Tetracosactide sinusitis drainage	TR
sinusitis	streptococcus	Ampi IV TMP-SMX Siso IM } 6 weeks	Mannitol Clonazepam craniotomy (26th day)	seizures
sinusitis	unknown	Ampi TMP-SMX Siso } 6 weeks	Mannitol Clonazepam	TR
sinusitis	unknown	Ampi TMP-SMX Siso } 8 weeks	Amox 4 months Mannitol Clonazepam	TR
sinusitis	unknown	Amox 5 months Ampi TMP-SMX } 4 weeks Metro	Mannitol Clonazepam sinusitis drainage	TR
otitis	unknown	Ampi TMP-SMX Siso } 4 months	Mannitol Clonazepam surgical treatment otitis	TR
sinusitis	unknown	Ampi TMP-SMX } 5 weeks Amox 4 months		TR
post-traumatic sinusitis	unknown	Ampi TMP-SMX } 4 weeks PRIS 3 months	Mannitol Clonaxepam surgical treatment of post-traumatic sinus lesion	TR

antibiotics. To our knowledge, antibiotic has never been found in the pus of subdural empyemas, as it has in brain abscesses;¹⁹ nevertheless, in our cases 2 to 7, antibiotics were sufficient to improve the patients' state and to normalise the CT scan. In two of Rosazza's cases¹³ and in Rousseaux' case,²⁰ antibiotics had also been able to cure such lesions. Our first patient was surgically treated one month after the

onset of the antibiotherapy: his neurological condition had improved, but surgery was decided because the size of the most posterior part of the empyema had gradually increased; this patient was our first medically treated patient but now, with Rosazza and Rousseaux' experiences,^{13 20} and from our next six patients, we think that it would have been possible to treat him without surgery. In Kaufman^{1 21} and

Fig 2 (Patient 2) (a) On admission: interhemispheric subdural empyema. (b) During the 6th month: CT scan is normal.

Fig 3 (Patient 3) (a) On admission: frontal subdural empyema. (b) Eight months later: no residual empyema.

Fig 4 (Patient 4) (a) On admission: interhemispheric subdural empyema. (b) Four months later: no residual empyema.

Holtzman^{1 22} cases, the neurological condition deteriorated in spite of antibiotics. We are not sure whether the dosage was sufficient, but, in our cases, although the patients often showed a little deterioration during the first 24 or 48 hours, we always continued the same treatment. So, we think that antibiotics are probably able to penetrate into subdural empyemas. The pus has been free of organisms in our patient 1 and reported by Borzone *et al.*²³ This penetration is perhaps made possible by an unusual development of meningeal arteries, as in our third case, which brought large quantities of antibiotics in the margin of the empyema.^{24 25}

It is not always necessary to know the causative organism from the empyema itself. In our seven cases, the causative organism was found only in the first patient, from blood cultures. Surgery is not indicated for identification of the organism as in brain abscesses; this is possible in less than 50% of the operated cases, and in 30% of the non-surgically treated ones, from blood or CSF cultures, or from the point of entry; moreover, the organism is, in most cases, sensitive to large spectrum antibiotics used intravenously with high doses.

Modalities of the medical treatment

We have used intravenous antibiotic therapy for 4 to

Fig 5 (Patient 5) (a) On admission: subdural empyema of the whole convexity. (b) One year later: CT scan is normal.

Fig 6 (Patient 6) (a) On admission: right frontal subdural empyema. (b) Four months later: no residual empyema.

6 weeks and oral antibiotics until the CT scan was normal in all cases except the first in which the patient himself stopped the treatment in the sixth week. We think it is possible to stop earlier, as in Rosazza' cases,¹³ but care is required to ensure sterilisation of these lesions. Clonazepam was used when generalised seizures occurred. Corticosteroids have been avoided during the acute phase as they prevent antibiotics from penetrating into the abscesses.⁸ To prevent oedema, 10% hypertonic mannitol was used during the first few days. Of course, surgical treatment might have been necessary for patients who were rapidly deteriorating neurologically with medical treatment. However, in our second and seventh cases, a little deterioration did not lead to surgery. In four cases, antibiotics alone were sufficient to treat the initial infection of paranasal sinuses; in one case, delayed surgery prevented relapse and in two cases, early surgery was necessary to treat the paranasal sinusitis.

Results

With classical treatment, associating emergency surgery and antibiotics, the mortality was high^{1 23 26-28} and sequelae (focal deficits or epileptic seizures) were frequent.^{1 5} In our cases, only one patient had sequelae, (generalised seizures) and he had

Fig 7 (Patient 7) (a) On admission: interhemispheric and temporal subdural empyema. (b) Six months later: no residual empyema.

been operated upon. After 6 to 30 months, the other six have no focal deficit or seizure. The three other patients previously reported^{13 20} in the literature, also have had no sequelae.

For these 10 cases, summarised in the table, the morbidity and mortality obtained by medical treatment alone seem better than those by surgical treatment,²⁸ as also shown in brain abscesses.¹⁰ Many studies have shown that the most important prognostic factor in intracranial infection is the level of consciousness when the treatment is commenced. Three patients (cases 2, 4, 6) were not in coma and they may therefore have been expected to have a better prognosis, no matter how they were treated. Nevertheless, the four others were in coma, and three had total recovery, and one little sequelae. In the literature, with surgery, the mortality and morbidity seem higher.²⁸

A long period of intravenous treatment may be a financial disadvantage as compared with perhaps a more rapid response to surgical drainage, leading to earlier discharge and cheaper overall treatment; nevertheless, shorter treatments are possible, as in our first patient, and it would be possible to discharge these patients earlier in the future, when our experience will be greater. Moreover, less sequelae is also a financial advantage.

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