Neurocysticercosis — experience at the teaching hospitals of the University of Cape Town

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Abstract **In the 15 years 1975-1989, 239 patients attending the associated teaching hospitals of the University of Cape Town have been identified retrospectively as having neurocysticercosis. One hundred and twenty-three (51,46%) were children 12 years of age or younger, 14 (5,86%) were adolescents aged 13 - 19 years, and 102 (42,68%) were adults 20 years of age or older. Two hundred and twelve (88,7%) of these patients were black, almost exclusively Xhosa-speakers originating from the eastern Cape homeland regions of Transkei and Ciskei.**

Although the clinical features of neurocysticercosis are protean, these patients could be divided into three clinicoradiological groups — a group with seizures, a group with raised intracranial pressure, and an asymptomatic group. One hundred and ninety patients (79,5%) presented with seizures, either alone or in combination with other neurological deficits. Eighty-six patients (36%) presented with features of raised intracranial pressure, due to hydrocephalus in 32 cases, to focal space-demanding lesions in 4 and to multifocal cysticercal encephalitis in 50. Of interest is the significant difference in the abnormality causing the raised intracranial pressure in the children as opposed to the adults — 44 children had multifocal cysticercal encephalitis while only 6 had hydrocephalus, and 26 adults had hydrocephalus while only 6 young adults (including 2 adolescents) had multifocal encephalitis. In the other 4 adults the raised intracranial pressure was caused by space-demanding mass lesions. Ten adult patients (4,1%) were 'asymptomatic' and a computed tomography scan for investigation of head injury revealed neurocysticercosis.

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Cysticercosis, a parasitic infestation of great importance in man, is due to the invasion of human tissue by the larvae of the tapeworm *Taenia solium*. The disease has a world-wide distribution but is most prevalent in developing countries.[1,2] The recognised endemic regions of the world are those areas where free-range pig farming is practised by people with inadequate sanitation and ineffective removal of human excreta from the environment (Fig. 1).

In endemic regions cysticercosis constitutes a major health problem, because of the large numbers of people infected. It is the commonest parasitic infestation of the central nervous system, producing significant morbidity and mortality.[3,4] In addition to the severe health and economic problems created by the human disease, cysticercosis of the more usual intermediate host, the domestic pig, results in large economic losses due to wastage of the infected meat or 'measly pork'.[5,6]

The symptoms and signs presented by patients with neurocysticercosis are extremely varied and there are no clinically diagnostic neurological syndromes. However, despite the numerous possible pathological changes and protean clinical features, the majority of patients present with problems related to seizures, raised intracranial pressure, localising neurological deficits, psychiatric disorders or combinations of any or all of the above.[3,4,7-11] Autopsy series[12] have shown that many people infected with neurocysticercosis are asymptomatic and the wide use of computed tomography (CT) in endemic areas is increasingly confirming this fact.

This paper reviews and categorises the patients with neurocysticercosis attending the teaching hospitals of the University of Cape Town in the 15 years 1975 - 1989. In addition these patients were divided into three major clinical groups: a group with seizures, a group with raised intracranial pressure, and an asymptomatic group.

Methods

Patients diagnosed as having neurocysticercosis while attending the University of Cape Town teaching hospitals were identified by review of: (*i*) the discharge diagnosis obtained from the Groote Schuur Hospital medical records; (*ii*) the listed diagnosis obtained from the records of the Groote Schuur Hospital Department of Neuroradiology — all the patients attending Somerset Hospital and those attending Red Cross War Memorial Children's Hospital from 1975 to 1987 were traced in this way; and (*iii*) the discharge diagnosis obtained from Red Cross War Memorial Children's Hospital medical records for the years 1988 - 1989, as CT scanning became available at that hospital during this period.

From the case records available for review 239 patients were accepted as having neurocysticercosis. The following criteria for its diagnosis were used: (*i*) *diagnosis definite* (for definite diagnosis at least one of the following criteria had to be present — (*a*) histological confirmation of cysticercosis from biopsy or autopsy specimens; (*b*) positive titre of cysticercus antibodies in serum and/or cerebrospinal fluid (CSF) of patients with compatible clinical and characteristic radiological features); and (*ii*) *diagnosis probable* — diagnostically characteristic CT scan features in patients from endemic regions in whom the evolution of the clinical and radiological features was compatible with such a diagnosis.

The charts of these selected patients were reviewed and data regarding race, district of origin, age, sex, clinical features, CSF findings, full blood counts, serum biochemical measurements, radiological investigations, electro-encephalographic findings and serological findings noted.

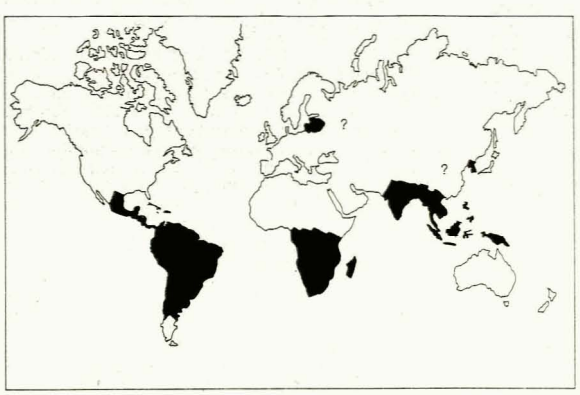

FIG. 1.
Regions of the world where neurocysticercosis is endemic.

All were classified according to the clinicoradiological format: (*i*) those with seizures with or without other neurological problems; (*ii*) those with symptoms and signs of raised intracranial pressure; and (*iii*) those who were 'asymptomatic' but were found to have neurocysticercosis on a CT scan done for other reasons, e.g. trauma.

Results

Between the years 1975 and 1989, 239 patients who attended the associated teaching hospitals of the University of Cape Town were identified as having neurocysticercosis; 88,7% of these patients were black, and 58,46% of the black patients were referred directly from the rural regions of Transkei and Ciskei. Another 36,52% of these patients came from the western Cape and were migrant labourers residing in the black townships and squatter camps of Greater Cape Town and its environs. Occasional black patients were referred for neurological investigations from further afield in the subcontinent. Over half (51,46%) of the patients were children 12 years of age or younger; most of these were black. There was no significant difference between the number of male (48,54%) and female (51,46%) patients.

The clinical division of the 239 patients into three clinicoradiological groups is shown in Table I. Some were classified as belonging to both the seizure group and the raised intracranial pressure group.

TABLE I.
Clinicoradiological groups

	Adults	Children	Total
Group I: seizures*			190
Epilepsy only	27	24	51
Epilepsy + { focal neurology, dementia, psychiatric }	13	21	34
Epilepsy + raised ICP	8	22	30
Acute seizure only	24	25	49
Acute seizure + raised ICP	4	22	26
Group 2: raised ICP			86
Hydrocephalus	26	6	32
Space-demanding mass lesion	4	0	4
Multifocal cysticercal encephalitis†	6	44	50
Group 3: asymptomatic			10
	10	0	10

*This group consists of patients presenting either with recurrent seizures (epilepsy) or recent onset of seizures ('acute seizures', i.e. initial seizure within the week before admission).
† Cysticercal encephalitis — CT (with contrast) demonstrates small ring-enhancing or homogenously enhancing lesions with surrounding white-matter oedema.[13,14] These CT scan features have been correlated with the histological findings of the encysted parasite surrounded by inflammatory exudate and oedema.[15,16]
ICP = intracranial pressure.

Discussion

The great majority of these patients (88,7%) were black. They came from the various Xhosa-speaking tribes of the eastern Cape homeland regions of Ciskei and Transkei. In these rural areas free-range pig farming is practised and sanitation is largely non-existent, and it is therefore not surprising that cysticercosis is so common;[17,18] Ciskei and Transkei in fact probably comprise the largest endemic regions in South Africa. Eradication of the disease in these homelands by preventive measures such as education, improved sanita-

tion and improved farming methods is unlikely to be attained rapidly in the present socio-economic climate.

Most of the patients referred from the black townships and squatter camps of greater Cape Town were migrant workers and their families who came from Ciskei and Transkei. Only 3 black patients in this series were not Xhosas and came from other areas — Malawi, Namibia and the Transvaal, respectively.

There was a large number of children in this series. This was partly due to the dramatic presentation of the illness in this age group (40,6% of children presented with clinical or radiological features of raised intracranial pressure) and the resultant referral of many of them. Another reason was the absence, at the time covered by this review, of neurological investigative facilities at the regional hospitals in East London (Frere Hospital and Cecilia Makiwane Hospital). Presumably pica with geophagia accounted for the very heavy infestation in most of the children referred directly from the eastern Cape.

Initially more children than adults were diagnosed annually as having neurocysticercosis. More recently, the numbers of adult patients diagnosed have increased. This is probably related to the increasing influx of black labourers into the western Cape. Adult preponderance is the usual finding in series reported from endemic areas and is quoted in extensive review articles.[8,9,19]

Seizures were by far the commonest clinical manifestation (190 patients) and presented as the only problem in 100 (51 adults, 49 children). Epilepsy has been well documented as the commonest presenting symptom in neurocysticercosis.[10,20,21] Seizures as an isolated neurological problem occurred as commonly among children as among adults, but it is of interest to note that seizures plus raised intracranial pressure or plus one or more of dementia, psychosis and focal neurological deficit were much more common among children (65 children, 25 adults). The increased morbidity among the children with seizures was probably due to the patient selection and in particular the fact that many of them also had raised intracranial pressure. Any patient from an endemic area who presents with a neurological problem, in particular epilepsy, should be regarded as having neurocysticercosis until proven otherwise.

The next most common clinical presentation was raised intracranial pressure, which occurred in 86 patients (36 adults (31% of total adults) and 50 children (41% of total children)). The significant differences between the causes of raised intracranial pressure in children and in adults are of interest. Of the adults (including adolescents) with raised intracranial pressure, 26 (73%) had hydrocephalus, 6 (16%) multifocal cysticercal encephalitis and 4 (11%) focal space-demanding lesions. Of the children (12 years or younger), 44 (88%) had multifocal cysticercal encephalitis and only 6 (12%) hydrocephalus, and there were no children with space-demanding focal lesions large enough to produce features of raised intracranial pressure. These marked differences in the causes of raised intracranial pressure in adults and children with neurocysticercosis have been noted previously.[22]

Although only 10 asymptomatic adults in this series were found to have neurocysticercosis on CT scan of the brain done for other reasons, it is known from autopsy, radiological and serological studies done in endemic areas that many patients with neurocysticercosis are asymptomatic.[11,12,14,23]

I wish to thank Merck Pharmaceuticals South Africa (Pty) Ltd for permission to reproduce the map in Fig. 1.

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