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Outside Europe

Non-traumatic paraplegia in northern Tanzania

EUAN M SCRIMGEOUR

Abstract

A retrospective study of all 100 cases of non-traumatic (medical) paraplegia admitted to a large hospital in northern Tanzania over an eight-year period was undertaken; 15 of the patients were examined. Patients' ages ranged from 2 to 80 years (mean 31), and 67 were male. Seventy-one lived under 85 km (53 miles) from the hospital, and the average period from onset of symptoms of paraplegia to admission to the referral hospital was ten weeks. Tuberculosis was the most frequent cause of paraplegia (54%), followed by neoplasia (13%) and schistosomiasis (6%). No cases of nutritional myelopathy were diagnosed. In 12 cases a diagnosis could not be established. The average period spent in hospital was 11 weeks, and 35 patients made a good recovery and were ambulant at discharge.

Introduction

Paraplegia denotes loss of function of both legs as a result of disease or injury of the spinal cord, spinal roots, or peripheral nerves. Certain cerebral cortical lesions and myopathies can also result in paraplegia. There have been relatively few studies of non-traumatic paraplegia from developing and tropical countries.¹⁻⁶ Brief reports have come from Kenya,⁷ Uganda,⁸ and Tanzania,¹⁰ but this appears to be the first detailed study of non-traumatic paraplegia in East Africa.

Patients and methods

Kilimanjaro Christian Medical Centre (KCMC), with some 500 beds, is the principal referral hospital for northern Tanzania and serves about one million people. All 85 cases of non-traumatic (medical) paraplegia admitted from January 1972 to March 1979 were studied retrospectively, and I examined 15 patients admitted subsequently. All patients lived in Tanzania except for one man, who came from the Kenyan side of the border, 50 km (30 miles) from KCMC.

Only 14 patients had not been referred from peripheral hospitals. Information provided by referring hospitals was often sparse, but the KCMC case records were usually sufficiently informative to allow detailed analysis. Most patients were examined by a consultant within a few days of admission, and even when a precise diagnosis could not be offered, the structure affected and the level of the lesion were usually identified.

Most patients were initially treated in a well-equipped intensive care unit. Investigations carried out routinely included haemoglobin estimation, total and differential white cell count, erythrocyte sedimentation rate, sputum analysis, and chest radiography. Eighty-eight patients had spinal radiographs, 41 myelograms, and 62 lumbar punctures performed. Where applicable, biopsy of pleura or lymph nodes was performed. Biopsy specimens were also obtained in 22 patients who underwent surgical procedures on the spine. Mantoux and Venereal Disease Research Laboratory or Pandy's tests were available, and serum acid phosphatase concentrations could be measured. Schistosoma eggs were sought in urine, faeces, or rectal snips.

After discharge, few patients attended for review. Most returned to peripheral hospitals or to their villages, and no further information was recorded. It was impossible to try and ascertain the ultimate state of these subjects.

Results

Sixty-seven subjects were male, and 31 were Chaggas, the predominant Bantu group in northern Tanzania; others belonged to over 25 other tribal groups including Masai. Non-Negro patients included a Somali, an East African Indian, and an Arab. The age of patients ranged from 2 to 80 years (mean 31). Table I shows the age distribution of patients, with comparative figures for 47 traumatic cases admitted during the same period of study.

Most (95) patients came from rural areas, 71 living less than 85 km (53 miles) from KCMC. Eighteen were children or adolescents, but none attended school. Delay averaged eight weeks from onset of symptoms of paraplegia until initial admission to a hospital, and of

TABLE I—Age distribution of non-traumatic and traumatic paraplegics

Age (years)	Non-traumatic cases		Total	Traumatic cases
	Male	Female		
< 15	6	12	18 (18%)	3 (6.3%)
16-30	18	10	28 (28%)	24 (51%)
31-45	18	11	29 (29%)	16 (34%)
> 45	20	5	25 (25%)	4 (8.5%)

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those originally admitted to a peripheral hospital, 86 experienced an average delay of four weeks before referral to KCMC. The mean period between onset of symptoms of non-traumatic paraplegia and arrival at KCMC was ten weeks, whereas for traumatic cases it was under 24 hours (table II).

The commonest clinical presentation suggested acute or chronic interruption of spinal cord function; less frequent were syndromes suggesting lesions of the lumbosacral canal with variable dysfunction of the lower cord, conus medullaris, cauda equina, or emerging spinal

TABLE II—Time between onset of symptoms of paraplegia and arrival at KCMC

	Non-traumatic	Traumatic
< 24 hours	1 (1%)	24 (51.1%)
24 hours-1 week	5 (5%)	6 (12.8%)
1-4 weeks	29 (29%)	5 (10.6%)
> 4 weeks	65 (65%)	12 (25.5%)

roots. These presentations were variably associated at times with fever, backache, and spinal deformity. Two cases of acute ascending polyneuritis were also observed.

Cerebral cortical disease; demyelinating, hereditary, or degenerative spinal cord conditions; motor system or anterior horn cell disease; or myopathies were not diagnosed.

Table III shows the level and degree of paraplegia in 85 non-traumatic cases. In 15 cases no level could be determined. Complete paraplegia was defined as total loss of power in both legs together with impaired bladder function and a sensory level.

TABLE III—Level and degree of non-traumatic paraplegia

	Upper thoracic T ₁ -T ₈	Lower thoracic thoracolumbar T ₉ -L ₁	Lumbar L ₁ -L ₅	Total
No of patients	22 (25.9%)	47 (55.3%)	16 (18.8%)	85
Complete paraplegia	5	23	9	37 (43.5%)
Incomplete paraplegia	17	24	7	48 (56.5%)

Only 54 patients, including 24 with tuberculosis, underwent full investigation. Investigation was incomplete in 30 patients with tuberculosis, in two with syphilis, in one with neoplasia, and in one with schistosomiasis. On consideration of all available information a diagnosis could be made in 88 cases (table IV). In 12 cases it was impossible to suggest a diagnosis, as both clinical assessment and investigation had been incomplete.

TABLE IV—Diagnoses recorded in 100 patients with non-traumatic paraplegia

Diagnosis	No of patients
Tuberculosis	54
Neoplasms	13
Schistosomiasis	6
Syphilis	4
Tropical spastic paraplegia	2
Guillain-Barré syndrome	2
Functional	2
Viral myelitis	1
Cervical spondylosis	1
Spinal canal stenosis	1
Acute epidural abscess	1
Actinomycosis	1
No diagnosis	12

The mean time spent in hospital for non-traumatic cases was 11 weeks, but was 21.5 weeks for patients with paraplegia due to trauma. The mean time spent in KCMC was 12 weeks in cases of tuberculosis and neoplasms compared with nine for cases of schistosomiasis. Pressure sores and urinary tract infections occurred in 26 patients, urinary tract infection alone in five, and bed sores in three.

Table V gives the condition of patients at discharge. Although information about a patient's progress after discharge was usually unavailable, table VI summarises the information recorded for 46

TABLE V—State of patients at discharge

	Tuberculosis	Neoplasm	Schisto- somiasis	Others	All subjects
Improved (ambulant and independent)	22	0	5	8	35
Unchanged	6	5	0	5	16
Worse	1	4	0	0	5
Died	6	3	0	3	12
Absconded	5	0	1	4	10
Not known	14	1	0	7	22
Total	54	13	6	27	100

TABLE VI—Follow-up results in 46 tuberculous patients

Treatment completed	5 (10.8%)
Discharged to peripheral hospital: further progress unknown	15 (32.6%)
No record of follow-up plan	9 (19.5%)
Defaulted	11 (23.9%)
Died	6 (13%)

patients with tuberculosis after discharge. A further eight subjects had clinical and radiological features typical of tuberculosis, but laboratory confirmation could not be obtained.

Discussion

The development of paraplegia in a patient in a developing country is particularly ominous. In a poverty-stricken community the patient is likely to delay seeking medical advice, and the ultimate loss of working and earning capacity has an especially serious impact. Even if he succeeds in reaching a hospital he is unlikely to find skilled medical and nursing care, and satisfactory follow-up care will seldom be available.

The results of this study indicate that about a dozen patients with non-traumatic paraplegia present to KCMC annually. Although insignificant in numerical terms, these patients spend an average of 11 weeks in hospital and during this time they require a disproportionate amount of staff time and hospital resources.

Transport difficulties in the rural areas of Tanzania limit the accessibility of hospitals, and probably many patients in outlying areas failed to obtain any hospital treatment. The insidious onset that characterises non-traumatic paraplegia contributes to the delay in seeking hospital treatment. There is also a widespread belief in Tanzania that illness is the result of sorcery, and patients usually seek traditional remedies before presenting to hospital. Many patients present only when their disabilities become insupportable.

The mean period of four weeks before a patient admitted to a peripheral hospital was referred to KCMC is unlikely to be appreciably reduced. Pott's disease is so common that paraplegic patients who present to a peripheral hospital are often started at once on antituberculosis treatment without preliminary investigation apart from radiography, and many will make a good recovery. Only those patients who fail to respond or who develop complications will be referred. The difficulties of communicating with KCMC (by radiotelephone) and of obtaining suitable transport also discourage attempts to transfer patients.¹¹ Nevertheless, peripheral hospitals should be encouraged to refer as soon as possible all cases in which the diagnosis is uncertain and to avoid therapeutic trials in these patients.

The male predominance of 67% is unexplained, although this would be expected in traumatic paraplegia. The average ages of non-traumatic and traumatic cases were similar—31 and 32.7 years respectively, although more traumatic cases were in the 16-45 year age group (85% compared with 57%) reflecting the increased likelihood of such people engaging in hazardous activities. Tuberculosis in children and neoplasms in older

subjects contributed to a more even distribution in non-traumatic cases.

In 47% of cases the initial diagnosis was correct. Since spinal tuberculosis is the commonest cause of non-traumatic paraplegia in developing countries^{3 5 12} and was the most frequent diagnosis made in this study it was likely to have been the cause in many cases when the diagnosis could not be made with confidence. It is probably even commoner in northern Tanzania than indicated in this study as many cases are treated successfully in peripheral hospitals and are not referred to KCMC.¹¹ The pathogenesis of tuberculous paraplegia has been discussed in detail by Butler¹³ and Roaf *et al.*¹² Compression of the cord by granulation tissue, abscess formation, or displaced vertebral or disc tissue may occur, or radicular arteries may be occluded.

The features of spinal tuberculosis noted in this series were similar to those reported in other surveys.¹²⁻¹⁵ The mean age was 28. The diagnosis was made on clinical and radiological grounds in 33 subjects, and proved by bacteriological or pathological evidence in 13. Eight had clinical and radiological features strongly suggestive of tuberculosis but as laboratory confirmation was not obtained antituberculosis treatment was not started. Standard treatment for tuberculosis was streptomycin, isoniazid, and thiacetazone for eight weeks, followed by 16 months of isoniazid and thiacetazone. Eleven patients had anterior decompression and débridement operations, six of whom made a good recovery. Regardless of the level of involvement and despite delay in diagnosis, 41% of patients with tuberculous paraplegia were ambulant and independent at discharge. Satisfactory follow-up, however, could be obtained only in 11% of patients, while 24% of subjects defaulted.

As part of its tuberculosis control programme the Tanzanian Government provides BCG immunisation to all infants. To implement this programme, however, in impoverished rural communities in a vast sparsely populated country such as Tanzania is a formidable proposition, and in practice only half the children actually receive immunisation.¹⁶ Case detection rates for pulmonary tuberculosis in adults are equally disappointing, and only 20% of these patients receive adequate treatment.¹¹

Neoplasms produced paraplegia in 13% of patients. Comparative figures for other East African studies are unavailable, but in reports from other developing countries the number of patients with neoplasia has varied from 5% in Nigeria to 19% in South India.^{5 17} Metastatic neoplasms were the commonest malignancies encountered and four of the eight cases in this group were of prostatic origin. There was one case each of ependymoma, haemangioma, reticulum cell sarcoma, neuro-fibrosarcoma, and there was also an ill-defined cystic tumour of the conus. In Uganda Burkitt's lymphoma was the commonest cause of paraplegia in children,⁹ but no cases were observed in this series. Neoplasms were more frequent in an older age group (mean age 52 years). The diagnosis, confirmed by biopsy in five subjects, was made on the basis of raised serum acid phosphatase concentrations or radiological findings in the remainder. Since cytotoxic therapy and radiotherapy were not available in the region patients with malignant tumours were usually discharged to a peripheral hospital.

Schistosomiasis causes paraplegia as a sequel to the formation of granulomatous masses around ova in or near the cord, or secondary to acute hypersensitivity reactions to worms or ova, the resulting oedema interfering with cord perfusion and viability.¹⁸⁻²⁰ When the intra-abdominal pressure is raised, venous blood may flow from the common iliac veins to the vertebral venous plexus.²¹ When schistosomal hepatic fibrosis is present altered haemodynamics might facilitate the ingress of ova of even adult worms to the spinal canal.²² Both *Schistosoma mansoni* and *S haematobium* occur in northern Tanzania. Biopsy evidence of a *S mansoni* granuloma was obtained at laminectomy in one patient in this group. In the other five cases the diagnosis was presumptive as other conditions appeared to have been excluded; *S mansoni* ova were identified in rectal snips and gradual recovery followed treatment with niridazole. Bird¹⁸

suggested that schistosomal paraplegia might be commoner than is realised and as it was difficult to prove the diagnosis without surgery, a trial of schistosomicidal treatment should be considered in possible cases.¹⁸ Several workers, however, have expressed doubt that schistosoma granulomata could respond to schistosomicidal treatment.^{23 24} Schistosomiasis was detected as an incidental finding in four other patients. The average time spent in hospital by this group was nine weeks. Five patients were ambulant at discharge; one absconded. No follow-up reports are available.

Paraplegia resulting from tertiary syphilis may be due to anterior spinal artery thrombosis with the sudden onset of an initially areflexic flaccid paraplegia and diffuse meningomyelitis, which produces a slowly progressive spastic paraplegia.²⁵ Billingham⁹ reported that paraplegia resulting from syphilis occurred in Uganda, although it was "seldom recognised" there. Three of the subjects in this group were young adults (mean age 29). A positive Venereal Research Disease Laboratories test result in blood only was noted in two patients whose paraplegia had an alternative explanation.

Other conditions encountered in this study are listed in table V. Two patients exhibited the features of the syndrome described as tropical spastic paraplegia, which is an obscure condition reported to occur sporadically in many tropical or developing countries including Nigeria,⁵ South Africa,²⁴ and South India.¹⁷ A non-compressive spastic paraplegia develops over several weeks with posterior column and bladder or bowel dysfunction. Examination of cerebrospinal fluid and spinal radiography and myelography characteristically show no abnormality. There is no clear relationship with nutritional deficiency. The condition is non-progressive, and there may be variable recovery of function in some cases over succeeding months. Similar cases have been reported in Kenya⁷ and Tanzania.⁸

Many studies of paraplegia have reported that adhesive arachnoiditis may be observed in some patients.²⁶ Many cases are idiopathic, but adhesive arachnoiditis may follow acute meningitis or result from chronic tuberculous, syphilitic or cryptococcal meningitis, or as a sequel to myelography. In Uganda, where it was reported to be common, most cases were of unknown aetiology.⁸ Arachnoiditis of unknown cause was observed by Haddock in Dar es Salaam.¹⁰ In the present series arachnoiditis was observed in four patients, two with neoplasms and two with suspected bilharziasis.

Although nutritional myelopathies appear to prevail in some developing or tropical countries, accounting for up to 27% of cases of paraplegia in West Africa,²⁷ they were not diagnosed in this study. No cases were seen by Billingham in Uganda,⁹ or by Haddock in Dar es Salaam,¹⁰ and they were believed to be uncommon in Kenya.⁷ Dietary dependence on maize rather than cassava in East Africa may account for the rarity of nutritional myelopathy here. Chronic cyanide poisoning may result from eating cassava and is believed to be an important factor in the pathogenesis of the tropical spastic neuropathy syndrome described in Nigeria and reported to occur in many tropical countries.⁵ In Jamaica paraplegia with predominantly spastic or ataxic features has been described in which nutritional deficiencies may play a part and in addition there is a strong association with positive treponemal serology.⁶ In Central India lathyrism caused by the consumption of a pulse *Lathyrus sativa* containing a toxin B-(N)-oxalyl aminoalanine produces an acute or subacute spastic paraplegia without sensory loss or bladder dysfunction.²⁸ This pulse is not cultivated in northern Tanzania.

In 12% of cases in this study a retrospective diagnosis could not be made. Similar studies in other developing or tropical countries have shown that 5-40% of cases remain undiagnosed^{2 24} because of delay in presentation, inadequate assessment, difficulty in interpreting the data obtained, etc.

The number of myelograms and lumbar punctures performed in this series was relatively low. Myelograms only became generally available in 1976 with the arrival of staff able to perform this procedure. Both investigations were omitted in 24 patients in whom a diagnosis of tuberculous or metastatic

neoplastic disease had been made on radiological grounds together with supportive laboratory evidence of the presence of the disease elsewhere. Some of the patients in the first group were already improving on antituberculosis treatment when admitted to KCMC. Several refused to submit to these procedures or absconded before they could be performed. In some instances, especially in some undiagnosed cases, there was a clear indication for performing these tests but they were omitted for no apparent reason. Thirty-eight of the 41 myelograms were performed for diagnostic reasons. Eight patients who had myelography underwent explorative laparotomy. The procedure was not usually carried out in subjects undergoing anterior decompression operation in Pott's disease.

In this series there was a mean delay of eight weeks before a patient presented to hospital, and in KCMC a mean delay of three weeks before a firm diagnosis was made. Regardless of the delay before presentation, a full assessment must always be performed. Although the neurological assessment of paraplegia requires considerable expertise and a sound knowledge of the anatomy of the spinal canal and its contents, the data yielded by a detailed history, careful general examination, and a methodical neurological assessment should serve to identify the structure and level affected. A plan of investigation should be drawn up on admission. Relatively few tests are required to identify the main possibilities, and if spinal radiography and myelography are available a rational working diagnosis should soon be established. When tuberculosis is suspected, appropriate treatment should always be started, pending the results of investigation. This is especially important in centres lacking good radiological and surgical services. Even in KCMC where optimum facilities existed only 28% of patients diagnosed at discharge as having tuberculosis had had bacteriological or pathological confirmation of the diagnosis.

I would like to record my indebtedness to the late Mr Ian Hulme-Moir, consultant surgeon, KCMC, for encouraging this study and to Dr Konrad Mmuni, senior physician, and Dr Michael E Jones, consultant physician, KCMC, for their support of the project. Dr Nicholas Fisk kindly supplied the figures for traumatic cases given in tables I and II.

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Does the sedative flurazepam hydrochloride produce a bitter taste in the mouth the next morning?

A bitter after-taste has been reported occasionally with flurazepam,¹ and is mentioned in the data sheet for Dalmane. The cause is unknown. Flurazepam does taste bitter, possibly more so than other benzodiazepines, and this may have something to do with it. The problem does not seem to occur with other benzodiazepines.—LINDA BEELEY, consultant clinical pharmacologist, Birmingham.

¹ Greenblatt DJ, Allen MD, Shader RI. Toxicity of high-dose flurazepam in the elderly. *Clin Pharmacol Ther* 1977;**21**:355-61.

A doctor who had conducted psoralen-UVA (PUVA) clinics weekly for 12 months developed a malignant melanoma (right lower leg) at the end of the year. Her skin is pale Celtic and "never tans." Would you advise her to discontinue working in PUVA clinics in future?

The short answer is "Yes," but this would be a defensive response in a complex state of affairs, where much needs to be learnt and there are many imponderables. The role of terrestrial sunlight or artificially produced solar simulated ultraviolet radiation in the pathogenesis of malignant melanoma is controversial. On epidemiological grounds they seem to be linked somehow, but possibly not directly. The spectral output of the ultraviolet radiation lamps used in so-called PUVA treatment as generally given is so-called UVA radiation

(315-400 nm)—a waveband region of relatively low biological activity compared with shorter wavelengths. In fact, PUVA lamps emit about 0.5% shorter wavelengths, so-called UVB. UVA may cause erythema, often transient, and pigmentation. The erythema tends to occur only in pale-skinned normal people, of so-called Celt type, who do not pigment at all or only slightly. Darker-skinned people respond to UVA, if the dose is high enough, by increased pigmentation.

But all is completely changed if the patient takes psoralen, usually 8-methoxypsoralen, by mouth. The erythral and pigmentary responses are greatly increased. In addition there are psoralen photo-adducts with DNA in the epidermis; these are thought to cause decreased DNA synthesis (presumably explaining the therapeutic effect of PUVA) and increased mutagenesis and cancer of the skin. In the experimental animal continued high-intensity PUVA treatment can cause cancer of the skin. But this is not proved for PUVA treatment that is properly conducted in man. Staff working in PUVA clinics clearly should avoid undue exposure to the relatively powerful UVA lamps that are currently in use, but as the staff would not be taking psoralens as the patients do they should not be liable to the DNA effects. The pale-skinned "Celtic" doctor who "never tans" and has developed malignant melanoma on the lower leg is theoretically at more risk than those who are dark and who do tan, almost negligible though these risks would seem to be to staff. In view of current lack of firm data, it would appear wiser if she discontinued supervising PUVA clinics.—I A MAGNUS, professor of photobiology, London.