abnormal signs resolved in part during the next two months, after which he was discharged to another hospital.

The cerebrospinal fluid on day 7 contained 30 lymphocytes/mm^3, 2,200 R.B.C./mm^3, and 70 mg protein/100 ml; on day 19, 263 lymphocytes/mm^3 and 130 mg protein/100 ml; and on day 102, 8 lymphocytes/mm^3 and 80 mg protein/100 ml.

Cells from the lumbar cerebrospinal fluid were examined for *H. hominis* antigens and immunoglobulins by indirect immunofluorescence. In the first sample (day 31) there were plentiful mononuclear cells; about 15% contained *H. hominis* antigens and 20% contained IgG or IgM. A subsequent specimen (day 53) showed only small numbers of IgG-containing cells, and no *H. hominis* antigens were detected.

H. hominis was isolated from the cerebrospinal fluid taken on day 7; this finding was not available until late in the illness. The serum titre to *H. hominis* rose from 1:8 on day 3 to 1:80 on day 53.

On admission to this hospital the electroencephalogram was diffusely slow without periodic complexes. Over the next three days it deteriorated as the small amount of alpha rhythm disappeared; it then slowly improved, to become normal two months later.

Comment

Both these patients suffered from *H. hominis* encephalitis. The first had an appropriate serum antibody response, changes in the electroencephalogram which may be diagnostic of this condition (Upton and Gumpert, 1970; Illis and Taylor, 1972), and typical pathological changes at necropsy (van Bogaert *et al.*, 1955). The second patient had a similar antibody response, cells in the cerebrospinal fluid contained herpesvirus antigens, there were other typical changes in the fluid, and the virus was isolated from it. Clinically, this diagnosis seemed unlikely at first because both patients presented with brain-stem disorders, which are not usually thought to be associated with herpes encephalitis. The first patient had clinical and pathological evidence of generalized encephalitis which had caused particularly severe damage to the brain-stem. In the second patient the clinical lesions were even more strikingly confined to this region. Brain-stem encephalitis is an ill-defined entity, and patients suspected of suffering from it are commonly found to have other conditions. It is very unusual for any aetiological agent to be isolated (Bickerstaff, 1957).

With the development of effective antiviral chemotherapy it is becoming increasingly important to identify the aetiological agents in cases of encephalitis. There is some evidence that idoxuridine is at least partly effective in the treatment of *H. hominis* encephalitis (Nolan, *et al.*, 1970), especially if it is given early in the course of the disease. A prerequisite for the rapid diagnosis of infection by a specific virus is to regard it as a possibility. The speediest laboratory investigations likely to be of help are probably electroencephalography, which may be diagnostic under certain circumstances, and the immunofluorescent detection of viral antigens in cells from the cerebrospinal fluid (Sommerville, 1968; Dayan and Stokes, 1970). The latter technique is limited by the availability of suitable antisera, but it can be of particular value in diagnosing or excluding those few viruses for which there are specific treatments.

Dr. A. D. Dayan is grateful to the Central Research Fund of the University of London and the Cancer Research Campaign for providing equipment and reagents for the immunofluorescence studies.

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Progressive Kidney Damage after Non-obstructive Urinary Tract Infection

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British Medical Journal, 1972, 4, 406–407

Most cases of chronic pyelonephritis in adults are the result of urinary tract infection in childhood (Asscher and Waters, 1971). Bailey, Little, and Rolleston (1969) reported a case in which a kidney diminished in size after an attack of acute pyelonephritis. In the present patient progressive shrinkage of both kidneys occurred over three years. This shrinkage was associated with persistent pyuria and a *Streptococcus faecalis* infection.

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Case History

A 39-year-old housewife attended hospital in November 1967 with a three-month history of four attacks of bilateral loin pain associated with rigors, frequency, and dysuria. Each of these attacks responded to ampicillin but they recurred within days after stopping the drug.

In October 1965 urine analysis had shown nothing abnormal and her blood urea was 18 mg/100 ml.

On examination in November 1967 there was tenderness of both loins and above the pubic arch. The blood pressure was 150/100 mm Hg, haemoglobin 12·4 g/100 ml, W.B.C. 16,300/mm^3, (polymorphs 83%), E.S.R. (Westergren) 40 mm in the first hour, and blood urea 19 mg/100 ml. Urine analysis showed protein +, urine deposit contained numerous pus cells, and a midstream specimen of urine was sterile. An excretion urogram (Fig. 1) showed slight dilatation of upper pole calyces, with loss of renal substance from the right upper pole and a scar at the left lower pole.

In June 1968 she was admitted because of loin pain, fever, and dysuria. Numerous urine cultures, including cultures for acid-fast bacilli, were sterile although pyuria persisted. The blood urea was 22 mg/100 ml and the creatinine clearance varied between 54 and 62 ml/min. Repeat urography showed the dilatation of upper pole calices to be a little more prominent. By October 1968 the blood urea had risen to 53 mg/100 ml and the creatinine clearance had fallen to 37 ml/min. A micturating cystogram was normal. Renal biopsy showed interstitial fibrosis with tubular atrophy alternating with areas of tubular dilatation. The dilated tubules contained proteinaceous casts. The glomeruli were well preserved. She was started on long-term treatment with ampicillin 500 mg four times daily. The attacks of loin pain and fever abated but sterile pyuria persisted.

In July 1970 ampicillin was stopped. In December the loin pain and

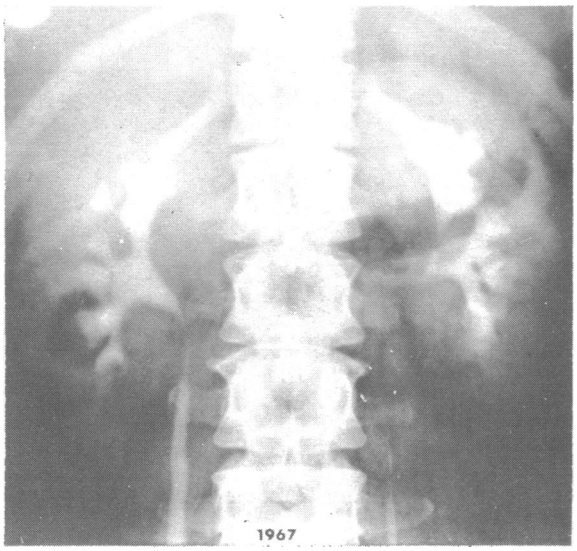

FIG. 1—Intravenous urogram (November 1967) showing slight caliceal dilatation of both upper poles with loss of renal substance from right upper pole and scar at left lower pole.

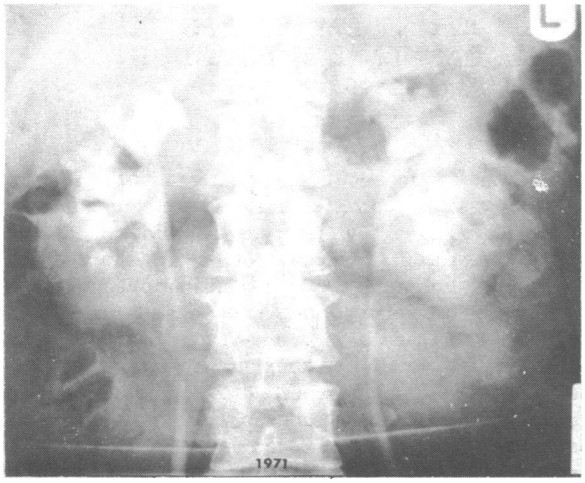

FIG. 2—Intravenous urogram (February 1971) showing caliceal dilatation more widespread than before. Both kidneys were smaller, length of the left kidney being 23 mm less than in 1967. (Radiograph obtained with comparable dose of contrast medium and at comparable time in examination as in Fig. 1, abdominal compression being applied.)

fever recurred. An excretion urogram performed in February 1971 (Fig. 2) showed more widespread caliceal dilatation with diffuse bilateral loss of renal substance. The length of the right kidney had diminished by 13 mm since 1967 and that of the left by 23 mm. In April 1971, during a further bout of loin pain and fever, urine culture showed a pure growth of *Streptococcus faecalis* on three occasions. Ampicillin therapy alleviated the symptoms but sterile pyuria persisted. A search for L-forms was initiated. Phase contrast microscopy and culture on biphasic medium proved positive for L-forms of *Str. faecalis*. A further renal biopsy showed appearances consistent with "chronic pyelonephritis." In September she was treated with erythromycin 500 mg and ampicillin 500 mg four times daily for two weeks. No further attacks of acute pyelonephritis occurred and the pyuria disappeared.

In March 1972 the blood pressure was 150/95 mm Hg, the blood urea was 38 mg/100 ml, and the creatinine clearance was 31 ml/min. Urine culture was sterile and L-forms were no longer in evidence.

Comment

The diagnosis of urinary tract infection proved difficult in this patient. Despite a three-year history of recurrent attacks of loin pain, fever, and dysuria, which improved symptomatically on ampicillin, sterile pyuria was the only abnormal finding in the urine. Eventually *Str. faecalis* was cultured from the urine, and L-forms were later identified while she was receiving treatment with ampicillin. The frequent relapses on withholding ampicillin were possibly due to re-emergence of the parent organism of the L-forms. The continuing pyuria on ampicillin suggests that L-forms may have played a part in the deterioration of renal function. Certainly, treatment aimed at eradication of L-forms with erythromycin and ampicillin resulted in a symptom-free patient with no pyuria.

It is only recently that L-forms have been sought in urinary tract infection. Guze and Kalmanson (1964) induced *Str. faecalis* L-form infection in rat kidney with penicillin. Other workers found L-forms in patients with chronic pyelonephritis (Gutman, Turck, Petersdorf, and Wedgewood, 1965; Gutman, Schlegel and Wedgewood, 1967; Domingue and Schlegel, 1970). The most unusual feature of this case was the progressive deterioration of kidney function. At no time did the history suggest obstruction of the urinary tract, nor was there any evidence of a high analgesic intake. Calculi were never found radiologically, and vesicoureteric reflux was not shown. After adequate treatment for L-forms was given no further deterioration of renal function occurred. The present case, therefore, illustrates the need to look for and treat L-form infections in patients with sterile pyuria, a conclusion which agrees with the observations of Fairley and Butler (1971). Furthermore, the present case calls into question the wisdom of using antibacterial agents which interfere with cell wall synthesis in the treatment of infections of the renal parenchyma, since drugs with this mode of action may induce the formation of L-forms.

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