FIG. 11. Scalar records mounted along the lead axes of a corrected twelve-lead spatial reference system based on Burger's scalene triangle.

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Renal disease in pregnancy

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SURPRISINGLY, little data is available about the maternal and foetal prognosis when pregnancy is complicated by renal disease.

Over the past 8 years we have studied various aspects of renal disease in pregnancy and our findings are summarized below.

Renal infection in pregnancy

This is certainly the commonest form of renal disease in pregnancy. Frank pyelonephritis of pregnancy occurs in about 1% of women and in over 30% of women who show over 100,000 organisms/ml in a urine specimen collected at

their first antenatal visit (Kincaid-Smith, 1965; Kincaid-Smith & Bullen, 1965). About two-thirds of all cases of pyelonephritis of pregnancy can be prevented by treatment of asymptomatic bacteriuria (Kincaid-Smith & Bullen, 1965).

The incidence of asymptomatic bacteriuria varies from 4 to 15% in various parts of the world (Kass, 1960; Kincaid-Smith & Bullen, 1965; Le Blanc & McGanity, 1965; Stuart, Cummins & Chin, 1965; Little, 1967). The complications of pregnancy bacteriuria also vary in different series. We related the high incidence of prematurity, foetal loss and pre-eclamptic toxae-

mia in bacteriuric women to the high incidence of underlying chronic renal disease which has been demonstrated in the two large obstetric hospitals in Melbourne (Kincaid-Smith & Bullen, 1965; Fairley, Bond & Adey, 1966).

The kidney was shown to be the site of infection in over 50% of bacteriuric women and radiological abnormalities were confined to the group with renal infection.

Most bacteriuric women have an increased leucocyte-excretion rate implying actual inflammation somewhere in the urinary tract, and the steady rise in leucocytes in the urine which precedes frank pyelonephritis in bacteriuric women shows that pregnancy bacteriuria cannot be regarded as a harmless saprophytic multiplication of organisms within the bladder (Kincaid-Smith & Bullen, 1965).

Acute renal failure in pregnancy

Acute oliguric renal failure may occur as an early or late complication in pregnancy. Most patients have acute tubular necrosis but a few, particularly those complicating accidental haemorrhage in late pregnancy, have cortical necrosis. Renal biopsy is indicated if a diuresis has not occurred within the first 2 weeks. With proper care, patients with acute tubular necrosis should recover while those with extensive cortical necrosis may fail to regain any effective kidney function.

Other forms of renal disease in pregnancy

The sparse literature on renal disease in pregnancy usually includes under the heading 'chronic nephritis' a wide range of cases varying from those with proteinuria alone to proteinuria accompanied by hypertension and serious impairment of renal function.

Opinions are divided about the outlook for the mother and the indications for terminating pregnancy. Our own experience has shown that in some cases, pregnancy may have an adverse, and at times disastrous, effect on otherwise stable chronic renal disease. Permanent renal damage is more often apparent when there is already serious impairment of function and when there is in addition significant hypertension during pregnancy.

Factors influencing the course of the pregnancy in patients with renal disease

(1) Impairment of renal function

The blood urea remained at a higher level after pregnancy in all but one of eleven pregnancies in nine patients with serious impairment

of renal function. The blood urea was above 50 mg/100 ml during pregnancy in these nine patients and all were delivered after the 30th week of gestation. The outlook for the foetus was surprisingly good in that nine of eleven babies survived; however, of five patients who started pregnancy with blood urea levels between 40 and 130 mg/100 ml, three died of renal failure within months of the pregnancy, and the other two showed permanent elevation of the blood urea above 300 mg/100 ml.

In these patients, 'pre-eclamptic toxæmia' is certainly one of the mechanisms whereby renal function deteriorates during pregnancy. If this comes on early, there is little purpose in continuing the pregnancy because there is no chance of a successful outcome. Our overall foetal mortality in twenty-two pregnancies in women who had renal disease and blood ureas over 50 mg/100 ml during pregnancy was 50%. This included women in whom pregnancy was terminated for early 'pre-eclamptic toxæmia'. The maternal results were, however, so unsatisfactory in the nine patients with poor renal function whose pregnancies continued until the baby was viable, that we wonder about the advisability of undertaking or continuing pregnancy in women in whom the renal function is known to be impaired. Mackay (1963) found no foetal survivors among patients with a blood urea over 60 mg/100 ml and although our foetal salvage rate was better, the maternal morbidity was very high in our patients in spite of careful supervision.

A careful watch must be kept on renal function during pregnancy. Blood urea and creatinine clearance estimations should be done twice weekly in the last trimester.

(2) Hypertension

Almost all patients with renal disease have blood pressures above the accepted 'normal' (120/80) for pregnancy (Browne & Browne, 1960).

The appearance of severe hypertension in patients with renal disease is an added indication for termination of pregnancy. It is often a manifestation of pre-eclamptic toxæmia and accompanied by focal narrowing of retinal arteries. Retinal vessel damage is much more severe in pregnancy than at a comparable blood pressure level in a non-pregnant woman, thus retinal haemorrhages may occur at a pressure as low as 160/90 during pregnancy.

(3) Pre-eclamptic toxæmia

It is very difficult to make a clinical diagnosis of superimposed pre-eclamptic toxæmia in a

woman who already has a raised blood pressure, oedema and proteinuria. The woman who presents acutely with these features before the 20th week of pregnancy may have either pre-eclamptic toxæmia or some form of acute renal disease. Renal biopsy is a useful diagnostic technique in such women. Undoubted histological changes of pre-eclamptic toxæmia may be present as early as the 14th week of pregnancy and when they are found early in pregnancy, the pregnancy should be terminated.

(4) Nephrotic syndrome

When a severe nephrotic state has appeared during pregnancy, it has usually persisted after pregnancy and has been resistant to treatment. Deterioration in renal function has also been noted in some patients with the nephrotic syndrome.

Acute nephritis in pregnancy

Wilson's (1958) experience suggested a poor outlook for mother and foetus when acute nephritis develops during pregnancy and very few other records are available.

We have not found published data about acute nephritis diagnosed on histological grounds during pregnancy. In two patients in whom we made the diagnosis on a renal biopsy, both mothers made a clinical recovery and one baby did well, although the other was stillborn.

'Chronic nephritis' in pregnancy

If a patient presents before the 20th week of pregnancy with persistent proteinuria, a diagnosis of 'chronic nephritis' is often made. We have used renal biopsy to assist with the diagnosis in this group.

TABLE 1
Proteinuria in early pregnancy:
histological finding in sixty-four cases

Focal glomerulonephritis	34
Diffuse glomerulonephritis	11
Minor focal basement membrane changes	5
Lupus nephritis	4
Diabetic glomerulosclerosis	3
Severe hypertensive vascular disease	3
Polyarteritis nodosa	2
Goodpasture's syndrome	1
Normal	1

Table 1 shows our findings in sixty-four patients. Most of these had focal glomerular lesions varying from inactive scars to active pro-

liferative lesions and varying in the extent of glomerular involvement. Biopsies were often done early in pregnancy and thus the changes in some patients could not represent previous damage from pre-eclamptic toxæmia. In those patients biopsied after pregnancy, toxæmia certainly contributed to the histological abnormalities.

In twenty-three patients in whom a histological diagnosis of mild focal glomerulonephritis was made, there was no foetal mortality but there was a 20% foetal loss in twenty-five who showed severe focal glomerulonephritis.

Patients with diffuse glomerulonephritis also had a poor chance of a successful pregnancy. Only three of eleven babies (27%) survived in this group although the blood urea was only raised above 50 mg/100 ml in four patients. (Overall foetal mortality in patients with blood ureas above 50 mg/100 ml was 50%.) Pre-eclamptic toxæmia coming on early in pregnancy seems to be a major factor in the high foetal mortality in diffuse glomerulonephritis.

Because of this poor outlook for the baby and the unpredictable risks which the mother runs, it is doubtful whether one should advise pregnancy in a woman with diffuse glomerulonephritis even if the blood urea is normal. Two mothers with diffuse glomerulonephritis died of renal failure shortly after pregnancy and in another three there was a definite and permanent deterioration of renal function related to the pregnancy.

Renal artery stenosis

Six patients who presented with hypertension in pregnancy had renal artery stenosis demonstrated by arteriography after pregnancy. In three of these, the blood pressure fell to near normal levels after pregnancy and this does not exclude underlying renal disease as a cause of hypertension in pregnancy. Two other patients with renal artery stenosis developed malignant hypertension in the immediate post-partum period.

Polycystic renal disease

This form of renal disease seems to carry a particularly good chance of a successful pregnancy even when the blood urea is high. The renal function may, however, deteriorate considerably during pregnancy.

Conclusions

The risks of pregnancy are unpredictable in women with chronic renal disease. This is sufficient to justify termination of pregnancy on medical grounds in a woman with known underlying renal disease if she does not wish to take

the risk of pregnancy. On the other hand, a woman with mild focal glomerular disease may have two or three successful pregnancies under supervision without apparent ill-effect. One cannot be dogmatic about the outcome of any particular pregnancy. At this stage, we have only broad general principles to guide us. Diffuse glomerular disease is more serious for mother and foetus than focal glomerular disease. Hypertension complicating renal disease may be a serious development and if severe, may require immediate termination of pregnancy. A pregnancy may be successful in spite of serious impairment of renal function but further impairment usually occurs during pregnancy and this may be sudden and of very serious significance for the mother.

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Research into bronchitis and emphysema

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DURING the first half of this century the chest illness usually termed 'chronic bronchitis and emphysema' did not receive the attention merited by its high morbidity and mortality. When the Postgraduate Medical School was set up in a Municipal Hospital at Hammersmith it soon became apparent that chronic airways obstruction was responsible for a form of heart failure which was not the rarity which it had appeared to be to those whose view of medicine was confined to cases admitted to undergraduate teaching hospitals. The first British study of the haemodynamics of this condition was published from Hammersmith (Mounsey *et al.*, 1952) and a clinico-pathological conference held there of a case of respiratory and cardiac failure in which emphysema was not found at necropsy was reported at the same time (*Postgraduate Medical Journal*, 1951). Physiological techniques for the study of disordered pulmonary function and techniques for post-mortem examination of the lungs

in the inflated state were later developed (Heard, 1958) and laid the foundation of more recent investigations into the relationship between function and structure, which have enabled definitions to be clarified. A spate of epidemiological studies of early disease were stimulated by the smog of the late 1950s and early 1960s and have been carried on in parallel with these clinical and pathological studies of the later stages.

Epidemiologists, interested in comparative studies, cannot use the clinician's unstandardized methods of diagnosis (Cochrane, Chapman & Oldham, 1951). To overcome this difficulty a questionnaire on respiratory symptoms was designed, and later tested by duplicate studies on a group of Post Office workers. The errors encountered (Fairbairn, Wood & Fletcher, 1959) enabled improvements to be made and led to the production and publication of a standardized questionnaire (M.R.C., 1960) which, during the past 10 years, has had world-wide use and has