present in man.[3 4] Hitherto the Y chromosome had been regarded as the prerequisite for testicular differentiation, but the H-Y gene and the antigen it controls now appear to be the active elements, probably capable of transfer to other chromosomes or other cell surfaces and possibly subject to control from other gene loci. Techniques are difficult and the picture is far from complete, but this approach seems likely to explain many of the incompatibilities reported between chromosomal and gonadal sex, including sex reversal and ovotesticular states.

Given that the chromosomal sex and the gonadal sex are normal and compatible with each other, there are only two basic types of intersex: inappropriate masculinisation of chromosomal and gonadal females and failure of expected masculinisation of chromosomal and gonadal males. The occasional masculinisation of females by abnormal androgenic hormones has been easy to understand, masculinisation by 21-hydroxylase deficiency (the classical "congenital adrenal hyperplasia") being the outstanding example. Much more puzzling have been the extraordinary cases in which, despite the presence of XY chromosomes and testes, masculinisation fails to occur—the "testicular feminisation" or "androgen insensitivity" syndrome. It is now established that the "incomplete" form of this syndrome, in which embryonic masculinisation fails but pubertal masculinisation occurs, is due to deficiency of another steroid enzyme, 5α-reductase.[5] Embryonic masculinisation requires dihydrotestosterone, which is absent; pubertal masculinisation occurs directly through testosterone and is therefore unaffected. The "complete" androgen insensitivity syndrome seems on circumstantial evidence to represent a receptor rather than an enzymatic failure, as both embryonic and pubertal masculinisation fail despite high plasma testosterone concentrations. Now that the various enzyme defects have been defined the imprecise terms should make way for precise designation of the chemical abnormalities.

Because of society's conventions the clinician must still assign an individual to one or other sex—not usually according to fundamental biological principles but merely from a practical standpoint. But he can now do this with relatively complete scientific understanding, which is important for effective psychological support. Thus elucidation of the scientific basis of sex differentiation can contribute to compassionate and humanitarian care for those with such aberrations, and it also suggests a possible chemicophysical explanation of some deviant forms of sexual behaviour.[6]

A source of confusion is sex change. "Correction" of the sex of registration can be made and individuals may change their social sex, but change of chromosomal and gonadal sex has not been reported in man or in other mammals,[4] though it is commonplace in molluscs. Various hormone influences can, of course, produce a crop of ambiguous secondary sex characteristics, the most recently documented and publicised[7] being those produced at puberty in boys with congenital 5α-reductase deficiency. In biological terms, however, this is merely a form of delayed manifestation of sexual identity.

The liberally educated doctor of today should have a broad understanding of sex differentiation and its failures. But our professional responsibilities for education extend beyond our own ranks; until society knows that sex is not a binary phenomenon but a set of characteristics of bimodal distribution, it cannot show understanding and compassion to those who appear freaks in terms of the usual conventions. Recent serious attempts to inform the lay public about these matters[8 9] are to be welcomed, supported, and given only constructive criticism.

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Surgical needles

Surgeons are first and foremost craftsmen, with just as much pernickety interest in their tools as the most obsessional carpenter. Any of the large catalogues of surgical instruments will show the almost infinite variations of size, shape, and length of, say, artery forceps or dissecting forceps, each eponymously named, to pander to their individual requirements. Surgeons will debate for hours over the size and properties of their sutures, the potency of their skin disinfectants, and the colour of their operating drapes. Even the surgical needle now comes in well over 100 different patterns —no doubt reflecting the personal requirements of the prima donnas of our hospitals.

The fascinating story of surgical needles has recently been reviewed by Trier.[1] Needles are among the most primitive of man's appliances, the earliest, eyed and made of bone, having appeared between 20 000 and 35 000 years ago. The use of needles for surgical purposes is mentioned in the Edwin Smith papyrus, now nearly 5000 years old.

Needles threaded with fine wool, silk, sinew, and other materials have been used by surgeons for centuries, and the first suture swaged into a needle was invented by a Mrs Ella Gaillard over 100 years ago. To the surgeon the eyeless needle has the great advantage of avoiding the need to pull a double-suture strand through the wound, and time is saved by not having to thread it. By being attached to a length of suture material the needle is also less easily lost in the depths of the chest or abdomen.

Most modern surgical needles are manufactured from stainless steel wire, but recently a metallised monofilament nylon suture serving as its own needle has been introduced for microsurgery. The variations in the characteristics of needles run into dozens of permutations of size, diameter, curvature, and cross-sectional shape. Needles may have a cutting edge, and may be round bodied or blunt (the latter type being used for friable tissues such as the liver). Since most surgical needles are now swaged to sutures they are disposable, and providing a new and undamaged needle with each suture strand makes little difference to the cost of the suture.

With such an overwhelming variety of needles to choose from how should the surgeon decide which to use? Perhaps in many cases he simply takes the needle his theatre sister passes to him. As Trier[1] points out, however, certain requirements must be met if we assume that the surgical needle should introduce no damage beyond that inflicted by the suture on the tissues. The needle should make a hole in the tissue only large enough to allow the suture material to go through, so

minimising tissue damage; and bacteria, chemicals, and other damaging substances must not be introduced into the wound. It should be of the appropriate shape and design to permit rapid, accurate, and precise suturing. The needle is most easily manipulated if it is appropriate to the specific wound site and if the needle holder is the best one for that needle. Care in selecting the surgeon's needle will certainly contribute to better care of patients—and should also give greater comfort and satisfaction to the craftsman surgeon at his work.

[1] Trier, W C, *Surgery, Gynecology and Obstetrics*, 1979, **149**, 84.

Subacute sclerosing panencephalitis

Subacute sclerosing panencephalitis (SSPE) is fortunately an uncommon disease. In the United States[1] and in Britain[2] it affects only one per million children each year, but the incidence seems higher in the Middle East.[3 4] The mean age of onset is about 8 years, and there is an insidious process of personality change, deterioration in school performance, and difficulties with speech as common initial manifestations. Later myoclonic jerks are a prominent feature, and the disease then progresses remorselessly to spastic quadriparesis and loss of intellect. The condition is usually fatal within one or two years, but a few children survive for much longer.

There is little doubt that SSPE is due to persistent infection of brain cells with measles virus. Inclusion bodies within cerebral neurones were described by Dawson in 1934,[5] but it was not until 1965 that Bouteille *et al*[6] drew attention to their similarity to measles virus on electron microscopy. Soon after this observation patients with SSPE were found to have high titres of measles antibody in the serum and the cerebrospinal fluid and measles antigen was found in brain tissue.[7] In 1969 measles virus was cultured from the brain of a patient.[8]

Why these very few of the millions of patients with measles should develop a chronic infection of the central nervous system is unknown. Patients with SSPE have often had measles unusually early.[1 2 9] In hamsters the effect of intracerebral injection of SSPE virus varied with age,[10] chronic encephalitis being produced more readily in weanling animals. There may be racial and ethnic differences in susceptibility to SSPE; in the United States whites are more commonly affected than blacks, but in South Africa non-whites predominate.[2] In Israel Arabs and Sephardic Jews seem more at risk than Ashkenazi Jews. In the United States the disease is more common in rural areas,[11] an observation that led to a suggestion (unconfirmed by objective tests) that an added zoonotic infection might be implicated. The persistence of the virus in SSPE may be due, at least in part, to the presence of a high-molecular-weight factor which inhibits lymphocyte responses to it.[12]

Attempts at treatment have so far been largely unrewarding. Amantadine,[13] 5-bromo-2-deoxyuridine,[14] and transfer factor[15] have all been unsuccessful. Since 1974, however, there have been several case reports of improvement after treatment with isoprinosine, an antiviral agent; and Huttenlocher and Mattson have now reported a series of 15 patients treated with this drug.[16] Five of the patients showed improvement lasting for two years or more, and there are six still alive over four years from the onset of symptoms (but two of these were long survivors before starting treatment). Critical analysis of Huttenlocher and Mattson's patients shows important differences from other series,[17 18] which may have influenced the results.[16] Their patients were older than usual (mean age at onset of symptoms 12·8 years compared with the usual 7 or 8 years) and the sexes were equally represented (males usually predominate by two or three to one). The 19 patients listed by Risk *et al*[17] as having undergone spontaneous remission (six of their own patients and 13 from the literature) showed the same characteristics (mean age at onset 12·5 years, 9 boys, 10 girls). Some of Huttenlocher and Mattson's patients had very slowly progressive disease, which had lasted for up to six years before the start of treatment. Another recent report[19] gives details of six treated patients, of whom four continued to deteriorate, one remained unchanged, and one showed minimal improvement.

Clearly isoprinosine is not a cure for SSPE. The drug seems to be of no value in the rapidly progressive disease, but it may increase the rate of remission in older children with slowly progressive disease. Larger controlled trials, probably requiring international co-operation, will be needed to establish the value of the drug. Possibly the publicity given to isoprinosine will stimulate the development and assessment of other drugs which may be more effective.

The other unresolved question about SSPE is whether or not live measles vaccine can cause the disease. Data from the United States SSPE registry[9] suggest that the dramatic decline in measles between 1964 and 1968 is being reflected in a similar fall in incidence of SSPE since 1971 and that this fall is a consequence of immunisation. A small but constant number of cases of SSPE (about five each year in the United States) are being reported in patients with a history of immunisation with live attenuated virus but not of measles. With the decline of epidemic measles these cases are forming an increasing proportion of the total, rising from 12% in 1970 to 38·5% in 1974. Nevertheless, the risk of developing SSPE after measles seems to be about 10 times greater than the risk after vaccination. The best hope for the control of this vile disease seems to lie in high levels of vaccination and possibly in the development of new antiviral agents.

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