Most biliary surgeons find peroperative cholangiography of great value in detecting stones in the common duct and avoiding negative explorations and would deny the charges of Cassie and Kapadia that it is time consuming, attended by a high failure rate even in acute cases, and unduly expensive. The technique has been well described by Le Quesne.[11] In a series of 422 operations for gall stones Faris *et al*[12] performed 400 successful peroperative cholangiograms; without this help 16 out of 78 patients with common duct stones would have had their stones overlooked (20·5% of the choledochostomies) and 48 of the 322 patients without stones in the duct would have required exploration (14·9%). The negative exploration rate was significantly lower in patients who had peroperative cholangiography than in those who did not. This technique has the extra advantage of showing the number of stones to be removed, congenital anomalies of the biliary tract, a stricture at the ampulla, and, most important, dilatation of the common duct (more than 12 mm diameter). It can be refined by adding radiomanometry of the bile duct as described by Daniel[13] or using an image intensifier on the table. An additional refinement developed by Baxter-Smith and Middleton[14] is the technique of contact cholangiography (first described by Slattery and Saypol[15]), in which a Dentech occlusal film sterilised in Cidex is inserted behind the common duct after wide mobilisation of the duodenum and head of pancreas. They had seven technical failures in a series of 86 routine cholecystectomies but claim improved radiographic definition in the successful ones. The disadvantages are the need for considerably extended dissection in all cases and the restricted view of the biliary tract available on the contact film.

Despite these refinements of operative cholangiography and the most careful palpation stones are still left in the bile duct after exploration. Most surgeons perform T-tube cholangiography on the table after exploration, but the film is always difficult to interpret owing to the impossibility of excluding air bubbles and to retention of the dye in the bile duct through ampullary oedema. When the remaining obstruction is severe a wide transduodenal sphincteroplasty is probably indicated. Claims are now being made for the value of operative choledochoscopy at this stage,[16] though it prolongs the operation. Motson *et al*[17] have reported on 50 operative endoscopies using the rigid choledochoscope after choledochostomy and exploration, with residual stones and debris seen in seven, a stricture in one, and a tumour in one; of the 41 common ducts seen to be clear, the postoperative cholangiogram showed stones in two. At the end of a difficult operation where obstruction or stones are still suspected after exploration of the common duct there may be a place for choledochoduodenostomy.[18] This procedure is seldom necessary for the experienced surgeon using careful palpation and practising operative cholangiography; it has the disadvantage of leaving a sump of infected bile in the lower end of the common duct, which can cause cholangitis, jaundice, or pancreatitis.

Even when all these stages of the surgical hunt are completed satisfactorily the postoperative cholangiogram done via the T tube seven to 10 days later may show a residual stone, much to the mortification of the surgeon, with its increased risk of morbidity or mortality. In such cases the T tube should be kept in place, irrigated with saline or gall-stone solvents used as described by Motson,[19] and the T-tube cholangiogram repeated. If the stone remains and appears to be causing, or likely to cause, obstruction, percutaneous removal of the stone may be possible through the T tube using a flexible basket carrier under radiographic control. Mason has described encouraging results in 131 such cases,[20] and such results provide strong grounds for always using a T tube after choledochostomy. If, however, the T tube has been removed the final hope of attaining a clear bile duct is by transduodenal sphincterostomy and extraction of the stone.

In the end, there is still no certain way of always catching this elusive pimpernel; but the nuisance can be kept to a minimum by the care and experience of the surgeon, whether he be palpater, cholangiographer, choledochoscopist, or all three.

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The final epidemic

Just before Easter doctors from 30 countries met at Cambridge for the second congress of International Physicians for the Prevention of Nuclear War. Despite the warm sunshine and the friendly atmosphere of the meeting, its main conclusions were chilling. Nuclear war is becoming more likely every year and any nuclear war is likely to be global; the medical services cannot possibly cope with the casualties either short term or long term. These doctors have become convinced that any detailed, practical, realistic assessment of the outcome of a nuclear conflict shows that its consequences will be far worse than most people seem to realise. Not only will casualties be on a far larger scale than can easily be comprehended but the explosion of thousands of large nuclear weapons seems very likely to cause such damage to the atmosphere, to agriculture and food production, and to ecological systems that the planet may become uninhabitable in biological terms.

The physicians' conviction that nuclear war is becoming ever more likely is based on the continuing proliferation of nuclear weapons and their refinement. As weapons have become more accurate the response time has shortened; weapons left on the ground would almost certainly be destroyed, so that any nuclear conflict would very quickly become total. Furthermore, the increasing complexity of computer systems raises the spectre of war occurring as a result of technical malfunction.

Secondly, the physicians' examination of likely scenarios for attacks has shown that victims could hope for no medical treatment. Massive destruction would be complicated by lethal amounts of fallout, which would make movement in the open suicidal for many days or even weeks in all countries attacked—and also in many non-combatant countries too. The overwhelming belief of the assembled delegates was that plans for medical rescue and civil defence services create a dangerously false impression. No such services could operate. Even on the fringes of the devastated areas any surviving medical services would quickly be overwhelmed by the numbers of casualties.

There is, indeed, a conflict of interests. On the one hand, the physicians' movement is clearly right in campaigning against acceptance of the concepts of limited or survivable nuclear war. Proliferation of weapons must be halted; the appalling consequences of nuclear war need wider publicity, and in particular the peoples of every country should be made aware of the possibility (whatever figure is put on the probability) that nuclear war would make the whole planet uninhabitable and so would destroy the human race.

On the other hand, some doctors would survive in the first days of a nuclear war—in remote areas protected from fallout by geographical features. A very few would survive in the attack zones and would want to help the victims around them. The natural wish of many doctors and hospital personnel to make plans for such circumstances should not be criticised too harshly; it may be an ostrich-like wish to deny reality but it is understandable as a natural professional desire to be equipped to deal with a frightening possibility.

The international movement of physicians deserves support. Epidemics are controlled by preventive measures, not by organising treatment services. If nuclear war occurs it will be the start of the final epidemic—and prevention is the proper medical response to that threat.

Regular Review

Recent developments in imaging techniques

IVAN MOSELEY

Hi-fi enthusiasts are now reaping the benefits of one of the more recent applications of electronic technology: digitisation of audio signals. Only the most technically aware understand more than the basic principles of data acquisition and analysis; the rest of us are content merely to listen to our equipment with even greater pleasure than before.

Parallel changes have occurred in diagnostic imaging; digitisation of radiological and other images and the application of computers to the manipulation of the data obtained have burgeoned very recently to provide diagnostic information of a quite different order from that previously available. Few of us engaged in clinical practice see all facets of image data processing. The purpose of this review is to explain, in non-technical terms, recent developments in data acquisition and analysis and to attempt an assessment of their potential clinical yield.

Computed tomography (CT)

Fringe experiments in analysis of radionuclide scans apart, the first major clinical application of image digitisation in radiology was computed *x*-ray tomography. Its principles and its impact on clinical practice are too well known to need amplification here. The technology of computed tomography has continued to advance, however, particularly in data analysis; and many of the recent developments are unfamiliar to anyone other than a minority of radiologists, the more so since nearly all scanners currently working in Britain are obsolescent.

Of the numerous computer software developments, five can be identified as of present or potential importance. The first is multiplanar reformat facilities (fig 1). The axial plane, in which computed tomography sections are most commonly obtained, is relatively unfamiliar to most clinicians—and indeed to many anatomists. Physical constraints preclude positioning the patient to obtain other planes of section that might be more useful in planning a surgical approach. Modern scanners, however, within a few seconds can construct sections in coronal, sagittal, or a large variety of oblique planes, using the data from the axial sections. Recent programs even allow tortuous structures such as the splenic vein to be "unravelled" and shown throughout their length in relation to their surroundings. Programs under development permit three-dimensional reconstruction, with shading to indicate depth, and can "shine a light" on to the reconstructed body from any angle.

Second is the use of variable scan speed, contrast, and spatial