Having had considerable practical experience of ultrasound in Tropical Medicine during my work in Africa establishing ultrasound training programmes, it was as a result of very kind sponsorship from Philips Medical Systems and BMUS that I had the opportunity to reinforce this with some theoretical education and training through attendance at this excellent short course held at the Division of Infectious and Tropical Disease at Pavia University. Pavia is an old provincial capital of Roman origin in Northern Italy and home to one of the more ancient universities in Europe, it is situated approximately 40 km south of Milan and in 1999 came first in the most ‘liveable city’ competition. It is a peaceful, clean town with a number of fine medieval churches and palaces in its cobbled streets.

Dr Enrico Brunetti organizer of this annual course with considerable experience and interest in ultrasound is head of the ultrasound unit within the Infectious and Tropical Diseases unit, which is part of the St Matteo hospital that has approximately 1200 beds, 60 of which are within this specialized unit. The course consisted of 20 h ‘hands-on’ practical teaching and 20 h of lectures. Emerging and re-emerging infectious diseases that used to be virtually unknown to physicians in industrialized countries are now increasingly encountered because of immigration from endemic countries. Topics included in the syllabus were:

- Ultrasound in prevalence studies of parasitic disease.
- Ultrasound in the diagnosis and treatment of abdominal abscess, cystic echinococcossis and schistosomiasis.
- Ultrasound in AIDS, fascioliasis and abdominal TB.
- Ultrasound and hepatocarcinoma along with the role of ultrasound in filariasis and the tropical spleen.

So it was time for a little acute revision in my reliable companion for the past few years, the Oxford Handbook of Tropical Medicine. Other participants in the course were clinicians from all over Europe and Russia with a variable amount of ultrasound experience, each with different medical expertise but all sharing a common interest in Tropical Medicine; some intending to work Overseas in the near future (see Fig. 1).

The mornings consisted of practical scanning sessions in the ‘Echographica’ Department, where many interesting ultrasound examinations and diagnoses were observed along with interventional procedures.

Detailed lectures included the increasing use of ultrasound in the diagnosis of cystic echinococcosis, hepatocellular carcinoma and sonography in AIDS, as well as ultrasound as an essential tool in the study of schistosomiasis, details of some of the content is discussed below.

Cystic Hydatid Disease

Echinococcus granulosis is a small 3–6-mm tapeworm that lives in the small intestine of dogs and, occasionally, other carnivores, such as foxes and wolves. Eggs passed in canine faeces are infective to humans, following ingestion they develop into larvae that penetrate intestinal mucosa and pass to target organs such as the liver (50%), lungs and peritoneal cavity. There the larvae mature and form an expanding fluid-filled vesicle or hydatid cyst — these may be multiple and reach massive proportions.

Cystic echinococcosis (CE) is due to infection with the metacestode stage of echinococcus granulosis, it has a global distribution, but is most prevalent amongst low socio-economic groups where safe piped water is generally unavailable, hygiene is poor, and where hospital, veterinary and educational facilities are of a low standard. Screening is justified and desirable in endemic areas as diagnosis at a early stage of infection can lead to a better prognosis following treatment. Standardized ultrasound classifications have recently been developed for CE. The sensitivity and specificity of ultrasound has been reported to be between 88–98%, respectively, for CE. The cysts have pathognomic signs on ultrasound and the technique is considered to be the gold standard, although it is still an imperfect test, and clinical, laboratory and epidemiological data also play an important role in the diagnosis. Ultrasound results should, where possible, be evaluated in relation to these findings. The use of the WHO standardized ultrasound classifications for CE should be used so that the properties of the test are standardized (see Fig. 2).

The following ultrasound images of hepatic lesions are considered to be pathognomic diagnostic signs of CE due to echinocccoccus granulosis.

- CE1: unilocular anechoic lesions, which are round or oval with a clear, well defined wall (laminated membrane), double line sign (laminated membrane and pericyst). Such cysts may or may not contain small dense mobile echoes (hydatid sand).
- CE2: multivesicular or multiseptated cysts with a wheel like appearance or unilocular cysts with daughter cysts, which may present with a wheel like appearance (see Fig. 3).
- CE3: cysts with floating laminated membranes, which may also contain daughter cysts.

CE cyst types CE4 and CE5, which although highly suggestive of CE are not pathognomic.

- CE4: heterogeneous, hypo-echoic contents. May show a ‘ball of wool’ sign, which is indicative of degenerating membranes.
hepatic cysts consistent with echinococcus granulosis, and serology was positive and treatment given. During the course, the patient returned for a follow-up scan of the now “inactive” cysts (see Fig. 4). The disease is prevalent in areas of sheep farming; this gentleman was a forestry worker in such an area.

Case History

A 52-year-old Sicilian male was admitted to hospital with symptoms of renal colic. Further investigation identified two hepatic cysts consistent with echinococcus granulosis, and serology was positive and treatment given. During the course, the patient returned for a follow-up scan of the now “inactive” cysts (see Fig. 4). The disease is prevalent in areas of sheep farming; this gentleman was a forestry worker in such an area.

Puncture, aspiration, injection, re-aspiration (PAIR)

This is an option for the treatment of cystic echinococcosis commonly known as hydatid disease; it is a minimally invasive

Figure 1. Dr Brunetti (centre) with some of the guest lecturers and students.

Figure 2. Ultrasound classification of CE images showing cyst types that have pathognomic signs. Types CE4 and 5 are highly suggestive of CE.
therapeutic alternative to surgery and chemotherapy. Performed under ultrasound guidance it is percutaneous drainage of echinococcal cysts located in the abdomen. Dr Brunetti, the course organizer was instrumental in the development of the WHO Guidelines on PAIR produced by the department of Communicable Disease, Surveillance and Response in 2003.

Hepatocellular Carcinoma (HCC)

The department provides care for a large number of patients with HCC and has noticed an increasing prevalence of HCC as a result of the increasing number of patients with Hepatitis C Virus (HCV). The patients at increased risk of developing HCC include those infected with Hepatitis B Virus (HBV), HCV, HIV, alcoholics, patients with haemochromatosis, Wilson’s disease and primary biliary cirrhosis.

For patients who do not have HIV the progression of the disease is slow, with chronic hepatitis it may take more than 15 years to develop HCC, whereas with HIV there is a fast progression to liver related death.

The mean age of patients with HCC is 63 years whereas in the presence of HCV and HIV the mean age is only 43 years. Interestingly, in Europe there is a decrease in the incidence of HCC from infection with HBV because of vaccination, yet an increase in the incidence of HCV, whereas in the developing world Hepatitis B is still on the increase.

Also it is unusual to develop extra-hepatic metastases with HCC, but when HIV is present the likelihood of extra-hepatic metastases is more likely.

The consultants within the unit offer treatment for HCC in the form of surgery or radio frequency ablation. They frequently use ultrasound contrast agents to aid visualization, HCC is fed by an arterial supply and, therefore, demonstrated immediately during the arterial phase.

Sonography in AIDS

Liver lesions

Ninety-eight per cent of deceased HIV seropositive patients present with liver lesions, neoplastic lesions tend to be focal, whereas inflammatory or diffuse lesions tend to be diffuse. Lymphomas and Kaposi’s sarcoma are the most common tumours in AIDS patients.

Focal lesions include either neoplastic lesions such as AIDS-related lymphoma (ARL), Burkitt’s lymphoma, Kaposi’s sarcoma or liver metastases, and opportunistic lesions or abscesses, which may be bacillary, mycobacteria or myceties.

AIDS and the biliary tree

HIV patients are at increased risk of cholangiopathy, it is the most common cause of abdominal pain in adult AIDS patients. It makes up 71% of surgical cases and 1.7–20% of non-surgical cases of hospital admission for AIDS. Related sclerosing cholangitis is the most common finding and almost all patients present with abnormal blood tests indicating cholestasis often caused by pathogens resulting in stenosis of the terminal portion of the CBD. Gallbladder wall thickening may also be witnessed in the absence of stones and this again may be due to cryptogenic pathogens. More rarely a malignant neoplasm occurs as a result of Kaposi’s sarcoma.

Renal involvement

HIV associated nephropathy is a unique form of renal disease specific to HIV infection, generally note increased echogenicity of the entire kidney. Biopsy reveals sclerotic glomeruli and dilated tubules. It is now estimated that 10% of patients with HIV go on to develop renal disease severe enough to require intervention.

Lymphadenopathy

Well-known feature of HIV with the upper abdominal nodes involved more often than those in the lumbar/iliac region (see Fig. 5). Lymphomas occur in 4–10% HIV patients.

AIDS and tuberculosis (TB)

High incidence of TB with AIDS patients and TB has now been adopted by the Centres for Disease control as one of the criteria for the diagnosis of AIDS. Negative chest X-ray findings in 50% of cases and ultrasound is useful for more critical evaluation.

Spleen

In addition to lymphomatous involvement of the spleen multiple hypo-echoic lesions have been reported in the spleen of HIV patients consistent with disseminated tuberculosis.

Pancreas

Ultrasound of the pancreas in AIDS is sensitive, but not specific.
Hepatosplenic schistosomiasis

Schistosomiasis (bilharzia) is the second most common cause of parasitic death after malaria affecting 200–300 million people in 76 countries and is mainly a disease of rural populations. Schistosoma haematobium causes urinary schistosomiasis and is found in Africa and South East Asia. Transmission occurs when humans are exposed to water infested with the intermediate snail host whilst swimming, washing or collecting water.

Urinary schistosomiasis begins 3 months after infection, often accompanied by painless haematuria, which may persist for months, and may be accompanied by pain and mild fever. Fibrosis and calcification of the bladder tend to reduce its volume producing frequency and dribbling. In severe cases there may be urinary retention, stasis, stone formation and renal failure.

Studies indicate that urinary tract abnormalities are common (18% overall prevalence). Research with the use of ultrasound examinations have shown that praziquantel and metrifonate therapy are rapidly effective in reversing urinary tract abnormalities with the exception of malignant bladder tumours that may develop. The reproducible ultrasound examination is an effective tool in the study of urinary schistosomiasis.

Hepatosplenic schistosomiasis

Hepatosplenic schistosomiasis is characterized by the periportal fibrosis (Symmer’s fibrosis), portal hypertension and splenomegaly. Demonstration of pathological lesions due to Schistosoma mansoni can be achieved by utilizing different techniques, but because of its sensitivity, specificity and simplicity ultrasound has replaced biopsy of the liver as the gold standard for detecting schistosomal periportal fibrosis.

Dr Brunetti is to be congratulated on the content and the popularity of this annual course and it leaves one with the taste that there is so much more to learn but I can highly recommend its value for anyone interested in the role of ultrasound in Tropical Medicine or Infectious Diseases. Italian hospitality was abundant and I am extremely grateful to BMUS, Philips Medical Systems and Leeds University for affording me this opportunity.

References