INTRODUCTION

Cancer, internal medicine and new imaging

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The true revolution in medical practice as a result of modern imaging over the last 20 years has primarily been concerned with the diagnosis and management of cancers, imaging playing a major role in the detection of a tumor and often raising the suspicion of its malignant nature. The combination of ultrasound, CT and more recently MRI in clinical practice has occurred so quickly and impressively that these investigations have become part of our daily routine and seem to have always existed. The best way of measuring the major impact of these techniques on our practice is to take a quick look into the past with the help of a few examples. Is a first epileptic fit the presenting feature of a cerebral tumor? In situations such as this, only the neurologist could even attempt to consult the oracle in order to unravel the secrets hidden within the skull vault which was opaque to x-rays. Although the investigation of pulmonary or mediastinal masses was aided by tomography, the abdominal contents and retroperitoneal space remained areas where the clinician was at a loss. Morphological assessment of the pancreas also depended on indirect tests, radiological investigation of the kidney was essentially reduced to visualization of the renal tracts, and the performance of lymphography was too selective for visualizing the retroperitoneal space. Certainly arteriography, performed secondarily, was contributive for large tumor masses, but had definite limitations. The creation of an artificial air contrast (air encephalogram, pneumoretroperitoneogram) could resolve some diagnostic problems but the painful experience of these examinations is certainly more deeply ingrained in the memories of patients than of the medical profession. Younger doctors might say that this is a walk into a medical museum from an other age: a museum certainly, but a contemporary one.

For the internist, the visualization of tumor masses by modern imaging has shown itself to be particularly important in two circumstances: the investigation of prolonged fever of unknown origin (FUO) and paraneoplastic syndromes. The causes of the former are extremely diverse, neoplastic diseases being responsible for 15-30% of cases. Pelvic and abdominal ultrasound, being simple, repeatable and inexpensive, has become the initial examination of choice. The bile ducts, liver, kidneys, sometimes the pancreas and retroperitoneum are well demonstrated. However, ultrasound does not detect small lesions and meticulous patient preparation is necessary. The clinician, who is rarely capable of personally analyzing the images, must consult a trained ultrasonographer, and the reliability of the examination is highly operator and equipment dependent. In addition, ultrasound is dependent on certain characteristics of the patient, particularly obesity. Abdominal and pelvic CT with the injection of contrast having previously excluded any contraindications is able to simultaneously demonstrate viscera (liver, spleen, pancreas, kidneys, uterus, ovaries) and the retroperitoneum (vessels and particularly lymph nodes). CT must be performed early to reduce diagnostic delays and provides an answer in a quarter of cases as demonstrated in a coordinated study by our team, and all this is achieved with minimal risk or discomfort to the patient. It also
has the advantage of providing hard copies which can be subsequently reviewed. Thoracic CT is of less value in the investigation of persistent fever but sometimes demonstrates lesions missed by the chest x-ray, particularly mediastinal lymphadenopathy and thymic pathology. Magnetic Resonance Imaging (MRI), which can be performed if there is a contraindication to iodinated contrast, has the added advantage of sagittal and coronal images. However, its role in the investigation of persistent fever remains less well evaluated than CT. Overall, these new imaging techniques, combined where indicated with endoscopic or endoscopic-ultrasound findings, have replaced the need for the exploratory laparotomy which was sometimes performed in the investigation of a FUO. The reasons for this are two fold. Certainly an exploratory laparotomy may still sometimes be indicated but today, far from being performed blind, it is guided by the imaging findings to suspicious areas within specific organs from which a histological diagnosis can be obtained. However, surgical intervention is often unnecessary to obtain a biopsy due to the advances in the performance of CT or ultrasound guided percutaneous biopsies. Undeniable improvements have so far been achieved using this technique in terms of peri-operative morbidity, patient comfort, cost, and healing delay before commencing chemotherapy. Nonetheless, these should not hide the limitations of this technique. These include inaccessible lesions (due to their small size and/or perivascular position), particularly inadequate specimen or specimens for precise histological typing of a non-Hodgkin’s lymphoma, and missing the true nature of a retroperitoneal fibrosis due to a paucity of neoplastic cells.

The problem of paraneoplastic syndromes for the internists similar to that of a FUO with two important differences: on the one hand, the search for a tumor is the principle or even the exclusive goal; on the other hand, certain conditions are only inconsistently associated with a cancer (only a quarter of adult cases of dermatomyositis) so that even a systematic approach is often negative, thus questioning its justification in terms of cost benefit. Sometimes the presenting symptoms strongly guide the search for a tumor towards a specific organ: the Schwartz-Barter or Eaton-Lambert syndrome/anaplastic small cell cancer, myasthenia/thymoma, to quote just two examples. Investigation by CT and/or MRI of the incriminated organ or region often gives the diagnostic answer. In certain situations, endoscopic ultrasound is the examination of choice: assessment of the prostate, systematic assessment of an ovarian carcinoma in a woman with dermatomyositis, visualization of a small pancreatic endocrine tumor. Moreover, the problems are even more complex. The presenting symptoms may be associated with a variety of cancers or the search for the tumor at statistically the most likely site is negative. The performance of a systematic multi-organ assessment is then guided by the levels of tumor markers and can justifiably be repeated several weeks or months after the initial targeted investigation because the first examination may miss a very small tumor. Since the prognosis following treatment is strongly dependent on the size of the lesion, repeating the scan to monitor size, which in the eyes of the manager may seem a complete waste of resources, is clearly totally justifiable. Apart from the clearly dramatic contribution to the initial diagnosis of the tumor, modern imaging has an equally important role in pre-therapeutic oncological staging. MRI is particularly useful in the staging of locoregional disease due to its ability to distinguish healthy from pathological tissue (fig. I.1) and to perform coronal and sagittal images which gives a representation of the tumor in three dimensions. All this is extremely important both for the choice of treatment strategies and for the calculation of the optimal dose. In a rather more anecdotal fashion, the non-surgeon can appreciate finally the rewards for all the time spent studying anatomy in his youth. CT has also a central role in the assessment of distant spread, not only reducing the indications for lymphography in malignant lymphoma to Hodgkin’s disease but also in certain diseases where the investigation of the brain or lungs has become indispensable in the initial evaluation.

MRI and CT also have an important role in the follow-up of patients after treatment. In the early stages, these are used to confirm the expected response to chemotherapy, sometimes allowing deferred surgical excision to be performed which was initially impossible, or conversely to identify treatment failure leading to a rapid change in therapy. In many sites, these constitute the only objective ways of assessing the efficacy of treatment. At a later stage, in association with monitoring tumor markers, modern imaging plays an important role in confirming complete remission or persistent disease. The diagnosis of recurrent disease can also be made, either local recurrence (sometimes very subtle in an area highly altered by the treatment) or distant metastases. The internist is often confronted with the difficult problem of a fever occurring in a known cancer patient in whom the answer is not always recurrent tumor or associated infection. Other causes, such as drugs, endocrine problems induced by interferon, as well as any other pathology which is independent of the initial disease must be excluded.