Images and Icons*

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Summary

Modern images have become essential to our daily work because they provide high quality representations which, with admittedly some difficulties and pitfalls, allow detection and diagnosis of lesions and moreover inspire and guide every step of surgery. This place and value of the image as the main source of technical information required for the patient’s management is straightforward and raises no major epistemological problem.

However, our use of images easily escapes critical thinking. Images may impose their own power and rationality. Medical images are powerful for the patient and for the doctor because they contain an unlimited source of explanation for the disease, they make disease and functional complaints comprehensible. They are important for the surgeons because they offer an unique and irreplaceable guide to the lesions, they make it visible, they give shape and in fact reality to what in the patient, belongs to surgery. This power of medical images is irrefutable because, rather than mere representations, they are analogical reflections of the real body with its real lesions, there is an ontological continuity between image and reality. For these and some other reasons we are tempted to give to images a consideration which should be due only to the patient himself. This temptation is idolatrous in nature. Under a number of different aspects this temptation pervades the entire field of medicine and might ultimately narrow our vision of patients, our vision of man.

Keywords: Images; icons.

Introduction

In the last 20 years neurosurgery has been, more than any other branch of medicine, flooded by images, wonderful images. Both our basic knowledge and our daily practice have been deeply and thoroughly transformed by images. This paper presents some observations on the way we use these images, how they function in our mind and in the mind of our patients. Certainly we use images as relatively simple tools of knowledge and action. But at the same time images are ambivalent objects which may seduce our judgment far beyond reason and critical thinking (see Spiro 1981, Caille 1990, Moles 1985, Poznanski 1993 ... among many).

Modern medical images are but the latest manifestation and achievement of a very ancient epistemological tradition. The French philosopher Michel Foucault said that the whole story of knowledge is “an effort towards the fundamental visibility of things”. In that sense the whole story of medicine is an effort to make disease visible. For a long time only the autopsy dissection could reveal the pathology, and unveil the disease. The first attempt at brain tumor resection was based on simple clinical findings, interpreted in the light of established clinico-pathological knowledge.

Images of course have tremendously speeded up the pace of visibility and accordingly have deeply transformed the conditions of our access to some aspects of disease. This is particularly true and important in surgery. Surgeons are concerned with lesions that in principle, are visible. In fact, visibility could be considered a hallmark of what in disease is amenable to surgery — the invisible is for only medical remedies — in our own field it is very clear that the major dates in the history of neuro-imaging stand as milestones in the development of neurosurgery itself, each new imaging technique opening new fields and new routes for our ambitions. To take but the last example, the surgery of brain stem lesions had really begun with NMR imaging.

Image as a Sign

Let us consider a daily neurosurgical image: on a contrast enhanced CT scan a large, white ring on a
dark background, in the middle of a cerebral hemisphere. This image in toto is a *sign* and before any analysis it means that there is something abnormal. Moreover this image yields *a number of signs*, the enhanced ring means disorders of the Blood Brain Barrier, the low density area around it means increase in water content of the tissue, the shift of the midline means high intracranial pressure gradients. Altogether these signs lead to a diagnosis and to a prognosis: this is likely to be a glioblastoma. This too familiar process is not in fact so simple. Signs have to be *detected* and this poses many theoretical and practical problems. Problems within the image itself concerning its resolution and definition, problems also with the competence of the physician who can detect or miss a sign according to his training and insight. Signs have to be *interpreted*, first in the context of a given technology, second in the context of the patient's story and likely diagnosis. White spots suggest different interpretations according to whether we are looking at a CT scan, with or without contrast enhancement or to an NMR study, to whether the patient is a young man with recurring neurological complaints or an old man with high blood pressure. Signs have to be *validated*. In some cases validation can be based on a direct mechanistic assessment, for example the water content of the brain has been correlated with the degree of X-ray attenuation. More generally, validation of signs in neuroimaging, as in any other domain of medicine, is the result of inductive reasoning, according to the cumulative process of empirical knowledge. Because we have been able, in a large number of cases, to verify that this particular image is correlated with a particular type of lesion found at surgery, we consider, in further cases, that this image is veritably a sign of this lesion. The medical image is immediately pregnant, it is an *object* which functions as a mirror image of the actual lesion in its setting, and we know in advance details of the form, structure, content of what we are going to find at surgery. The medical image is a "double" because it is always an analogical function of reality. The image results from the transformation of physical signal from the real thing. In some situations, like in PET scan imaging, conventional coloured scales are used for the restitution of numerical values from discrete areas sampled in the brain but in most cases a true physical contiguity, step by step, can be identified throughout the processing between the real thing and its image. From that we know with certainty that the image is a physical reflection of the lesion and therein lies its force, its usefulness and our confidence. However the image is not a direct presentation but rather an interpretation of the lesion through the particular type of physical transformation which has produced it. We have learnt that the image may be only partial and therefore possibly misleading. A small aneurysm identified on angiography may appear quite large on CT scan. Very often we have to use several imaging techniques, to produce several visualisations of the same lesion, none of them allowing a complete, exhaustive replica of the real thing.

**Image as a Map**

Furthermore the image functions as a *map*, the surgeon meets again the familiar anatomical drawings which have shaped his understanding and culture. Before operating upon the real lesion he may trace and anticipate every step of the actual approach on the image. To define and to trace a trajectory was once a bold achievement of stereotactic surgery, today a mapping of operative procedure allowed by CT and much more by NMR, is routinely and quite automatically accomplished before every intervention. For neurosurgeons trained in the sixties who had often to turn large craniotomy flaps relying on problematic shifts of arteries on angiography, scans and maps presently available are no small wonder. However technological advances already may yield an even more complete visualisation of the image for surgery. Integrated computerized systems combining 3D, reconstruction of a tumour from CT and NMR data obtained under ster-