

## Paradigm changes in medical science

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The medical sciences are in the midst of a revolution. In cancer research it is the DNA revolution which is certainly the most relevant. The understanding of the nature of oncogenic mutations and of the ability or inability of the DNA repair mechanisms to restore normality, the new knowledge regarding the proteins encoded by mutated genes and the ability to identify them in serum, the utilization of specific gene mutations as targets of new drugs, as prognostic markers and as indicators of response to treatment represent only a small part of the innumerable aspects of the new biomolecular developments.

A second area of very rapid progress is that of *imaging* or *diagnosis by images*, a definition that includes all the new diagnostic technologies for exploring the organs of the body by means of clear images.

Finally, we welcome the many advances in new technologies dealing with innovative forms of treatment, from radioguided to robotic surgery, from the use of ultrasound to destroy neoplastic lumps (HIFU) to the extensive use of radiotherapy with protons, from the exploration of light ions as a new source of high-energy radiation to the utilization of radionuclides linked to monoclonal antibodies that are directed towards specific targets (such as membrane receptors).

All these technological advances must be made compatible with the new concepts pervading the medicine of today and of the future. In fact, we are in a period of transition from paternalistic medicine to patients' rights, from a very specialized medicine to the holistic approach, from traditional medicine to evidence-based medicine, from the quantity of life as the sole objective to the increasing importance of quality of life, from the concept of administering the *maximum tolerable treatment* to the new concept of *minimum effective treatment*. Moreover, cancer treatments are becoming more *biological* than *anatomical*, and clinical medicine is becoming more and more differentiated between diagnostic medicine (with detection centers spread among the population in residential areas) and therapeutic medicine (concentrated in high-tech hospitals serving large territorial areas).

All these changes, both technological and organizational, will lend a new image to the medicine of the future, in particular to oncology. What will be needed is an in-depth discussion on how the patient-doctor relationship will be influenced by the aforementioned changes. A crucial and recurrent question is whether technology will substitute the doctor, since the diagnosis will be made not upon examination by the doctor, but through a number of laboratory, imaging and pathological examinations. Once the diagnosis is made the treatment will be automatically decided upon according to internationally recognized guidelines. What, therefore, will be the role of the family doctor and what will be the role of the hospital doctor? And how will the hospital staff and the family doctors cooperate?

The medical practice of tomorrow must be planned taking into consideration the rapid evolution of medical science. The DNA and imaging revolution in addition to organ transplantation and the stem cell revolution will alter the medicine of tomorrow. The common denominator of all these changes is the great progress of technology, especially in the fields of information technology and nanotechnology.

Finally, as science is progressing at a very rapid pace, the communication of results must follow the same development and it is easy to predict that the dissemination of research results on paper will be substituted by communication online. The great advantage, beyond the rapidity, is the fact that science will be made available to doctors in all corners of the world, and doctors of every continent will in the future receive the scientific messages through their personal computer. Another important goal will be

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the *open* system to give free access to science to all, without costs.

In conclusion, the full sequencing of human DNA, the diffusion of information technology, and the widespread introduction of nanotechnology are bringing about a true revolution in medical science and especially oncology. Prevention, diagnosis, surgery, radiotherapy, medical oncology and pathology are undergoing important changes, which will inevitably lead to an increasing dependence of medicine on technological progress. How will all of this modify the patient-doctor relationship? Various aspects of this technological resolution are discussed in the present issue<sup>1-5</sup>.

## References

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