Registration of drugs for treating cancer and HIV infection: a plea to carry out phase 3 trials before admission to the market

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Drugs for cancer and HIV infection tend to be admitted to the market on the basis of results from phase 2 trials. Assessing the benefit-risk balance with phase 2 trials often is difficult—the effect of the drug is usually temporary; the correlation between response or improvement of clinical measurements and the patient's wellbeing is often poor; and the side effects of drugs for these fatal diseases are serious. Therefore, although sometimes difficult to conduct, comparative trials that use standard treatment, placebo, or best supportive care remain the cornerstone for reliably assessing the benefit-risk balance.

The common criterion of drug regulatory committees for registration of a drug is that efficacy and safety have been shown in extensive pharmaceutical, pharmacological, toxicological, and clinical studies. Usually the clinical aspects of a drug are studied in phase 1, 2, and 3 trials, but whether all three phases are necessary for the registration of drugs for cancer and HIV infection is a matter of debate in Europe and the United States.

The media, the pharmaceutical industry, and the patients involved all put pressure on the drug regulatory authorities to accelerate the procedures and to relax the criteria for admitting oncolytics and drugs against HIV infection to the market. They argue that the three phases of clinical trials are time consuming and may withhold a potentially valuable drug from the patient for too long, and that this requirement is therefore not ethical. They advocate early registration if it appears from phase 2 trials that a tumor is responding and the outcome of the patients is better than that of historical controls; for such drugs phase 3 trials, in which the drug is compared with standard treatment, placebo, or untreated controls, can be omitted or done after marketing. They also say that drugs for HIV infection should be available as soon as possible—for instance, if a positive influence on surrogate end points has been shown.

In the United States and some European countries the authorities tend to allow early registration of drugs to treat fatal diseases and consider a positive outcome in phase 2 trials or a favourable effect on surrogate end points sufficient to authorise marketing. An accelerated approval may, however, come into conflict with the main task of the drug regulatory authorities: to assess the benefit-risk ratio of a drug. In contrast with the prescribers and consumers, the authorities have the opportunity to review all the data on a drug, and thus can give an impartial judgment about the balance of its benefits and risks. Since the community is aware of this impartial judgment and relies on it, early registration has the danger that false expectations are created about the efficacy of the drug.

Are randomised controlled trials always necessary for a reliable assessment of the risk or benefit of a drug? In some circumstances the answer could be no; if the results of phase trials indicate that the efficacy is unequivocal (a formerly fatal disease is cured) and the safety acceptable, marketing of the drug could be approved early. Observations in a few patients or even a "n=1 trial" theoretically would suffice for registration if the action of the drug is impressive. This situation, however, is rare. Although several classes of drugs have high "cure rates" (fluoroquinolones in urinary tract infections, omeprazole and H2-receptor antagonists in peptic ulcer disease, for example), most drug regulating authorities have not registered them without comparative trials.

Should other criteria be applied in fatal diseases? My answer is no, because especially in cancers and HIV infection, the benefit:risk ratio is much more difficult to assess than in other diseases.

Is treatment efficacious or beneficial?

In cancer or HIV infection it is very difficult to conclude whether a drug is efficacious or whether the treatment offers benefit to the patient. Most advanced malignancies and HIV infection cannot yet be cured with drug treatment. Mostly, the effect of the drugs is temporary, and best, death is postponed.

Cure is an unrealistic requirement for registration of oncolytics agents or drugs used in HIV infection, and the criteria for efficacy of these drugs have already been loosened. In the treatment of cancer the efficacy of a drug is determined by the number of patients responding (complete or partial disappearance of the tumour), duration of response, disease free interval, and the increase in survival. The effect of any cytostatic drug depends on the nature and extent of the particular malignancy, and in most advanced malignant diseases only 25-30% of patients may respond to the drug. Survival, although better than in untreated patients, seldom exceeds one or two years. Whether these figures are clinically relevant depends on the definitions of response, the proportion of patients achieving a complete response, and the implications of a complete response in the course of the disease. Such figures should not be underestimated, but such percentages would be unacceptably low for registration of drug treatments in many other diseases.

Examples are numerous: at present relatively low response percentages and a limited increase in survival can be achieved with registered treatments for malignancies of the gastrointestinal tract (5-fluorouracil for metastasised colon cancer),1 head and neck cancer (cisplatin),4 non-small cell lung cancer,1 renal cancer (recombinant interleukin 2),4 AIDS related kaposi's sarcoma (interferon alfa),1 and, more recently, paclitaxel for cisplatin resistant ovarian cancer. The new purine analogue cladribine for hairy cell leukaemia seems to be one of the exceptions,1 as in phase 2 trials this drug looks far better than interferon alfa; administration is also more convenient for the patient and the safety profile is acceptable.

In HIV infection the most important measures of efficacy are the occurrence of AIDS related events,
Placebo controlled trials might be avoided by a new oncolytic drug, illustrating the difficulty of assessing the benefit-risk balance of a new drug for cancer investigated without a control group.

Survival curve of cancer patients

Hypothetical (a) change in a new oncolytic drug and (b) side effects induced by.

Toxic effects

The second reason why benefit is more difficult to assess for oncolytic treatment and in HIV infection is that the drugs are often toxic; neutropenia, gastrointestinal side effects, alopecia, mucositis, neuropathy, or (in case of didanosine) the risk of pancreatitis, as well as frequent hospital admissions for complications of treatment (such as infectious episodes and the need for blood transfusions), may affect the quality of life of the patient and should be set against the temporary effect. Furthermore, the action of a particular drug is harder to interpret when more than one cytotoxic drug is given or when antimicrobial agents are also used.

Of course, one also cannot conclude automatically that a drug with a limited effect, which prolongs life only slightly and possesses many side effects, is not valuable for a patient. For instance, the detrimental impact of the side effects of chemotherapy for advanced breast or colon cancer on the quality of life of cancer patients seems to be less than expected. These data cannot, however, be generalised to all cytotoxic treatments.

Whether the treatment is beneficial depends on the definitions of response. When response is correlated with benefit or obvious palliation, improvement of the patient's general condition, or improvement in symptoms or laboratory markers associated with the cytotoxic drug is often based on the maximum tolerated dosage, but it has become clear that such an effect is poorly correlated with clinical outcome.

Wellbeing of the patient

Before a marketing authorisation is delivered, studies of the impact of the treatment on the patient's wellbeing should be required. One approach is to investigate the influence of the drug on simple clinical symptoms or laboratory markers associated with the malignant disease or HIV infection (fatigue, body weight, pain, dyspnoea, anaemia, anorexia, etc); another is to formally assess quality of life. Measures, but it has become clear that such an effect is poorly correlated with clinical outcome.