Yttrium-90 being Used to Treat Liver Tumours in Spain

Progress once more.

The A to Z of Materials
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The University Hospital at the University of Navarra is the only centre throughout the entire Spanish state for the treatment of liver tumours by means of radioembolisation and the one with the greatest accumulated experiences in the treatment throughout Europe. The technique consists of injecting spheres marked with Yttrium-90 – of very few microns in size – into the hepatic artery, from where they preferentially make for the tumorous zone. Here they remain lodged and emit radiation, which damages the tumour cells.

The treatment is complex and requires the close collaboration of the Departments of Nuclear Medicine, Conventional and Interventionist Radiology, Hepatology and Oncology.

In the primary tumours of the liver, also called hepatocarcinomas, the results show that the treatment is very efficacious in preventing treated lesions from growing: it achieves control – not eradication – of the disease in over 90% of the cases, at times over quite prolonged periods. Nevertheless, it does not avoid the appearance of new lesions in the liver and other organs.

Advantages and suitability

The treatment of hepatic tumours through radioembolisation has the advantage that it is not an exclusive procedure given that it can be administered in combination with quimiotherapy in those tumours that are responsive to this treatment. Moreover, its tolerance is quite high, it does not require long hospital stays, (normally patients stay just one day), and has a low risk of complications.

The technique incorporated at the University Hospital is particularly suitable for treating primary tumours of the liver (hepatocarcinomas) as well as secondary ones, above all, metastasis of cancer of the colon and endocrine tumours. Radioembolisation is an efficient alternative in those cases where the liver is host to several tumours and cannot be extirpated. The technique does not substitute surgery, rather provides the possibility of treatment in situations where there have been no therapeutic options to date.

However, when there is a risk that the spheres access the digestive tract, there are side-effects to the treatment. Moreover, neither is it recommended for patients who, in prior assessments, have been observed to capture very few spheres and, thus, in these cases, it is predicted that the treatment is not going to be efficacious.

Procedure

This therapeutic procedure is characterised by radiating the tumours directly and respecting the healthy liver. The microspheres are injected through a catheter in the hepatic artery, the only blood vessel that irrigates the tumorous zones of the liver, thus guaranteeing that the radiation preferentially targets the tumorous zone. The microspheres are marked with Yttrium-90 and transmit radiation when they arrive at the tumorous zone. Their effects can be evaluated after two months.

Once the suitability of the microspheres is established, specialists in Nuclear Medicine are responsible for deciding the suitability of the treatment and of calculating the dose appropriate for each patient. The principal aim of these treatments is to ensure that the radioactive spheres exclusively target the zone affected. However, there are situations where, given circulation problems or those involving connections between blood vessels, the spheres may travel to the lungs or other organs, such as the stomach or the intestinal tract and, thereby, cause considerable damage through side effects.

This is why, one week prior to treatment, and in cooperation with the Radiodiagnostic Service, a treatment simulation is carried out. In the first place, a hepatic arteriograph is carried out in order to view the arterial anatomy of the liver and, thereby, the vessels feeding the tumour. The hepatic artery has many anatomical variants and so there are branches thereof that feed other zones such as the duodenum and the bile duct. This is why hepatic vascularisation has to be restricted with the treatment preferentially targeting the liver.

During the planning stage, instead of introducing Yttrium-90 spheres, macroaggregates of albumin marked with Tecnecium were used. “This involves a radiotracer by which a gammagraph can be carried out in order to quantify the distribution by the organism of the radiotracer so that possible leaks of the spheres during treatment can be monitored. It should be taken into account that such a leak of Yttrium-90-marked microspheres can be damaging to the organs. Thanks to prior gammagrapy, the safety of the treatment is guaranteed and the dosage suitable for each patient calculated.

Once the suitability for treatment is established, the Yttrium administration kit is prepared – individualised for each patient, and the Yttrium administered by specialists from the Radiodiagnostic Service. This process requires the supervision of radiophysicians whose work is that of radiological protection and in the calculation of the dosage. “Before administering radiometabolic treatment, an estimate of the dosage the patient is to receive should be calculated, given that the amount of Yttrium-90 the organ will absorb has to be individualised for each patient. [In the calculations, the body surface of-the patient has to be taken into account. With all these figures, we can determine the optimum dosage to irradíate the tumour to the maximum and the healthy liver to the minimum.