European Network on Radioembolization with Yttrium 90 resin microspheres

Background information to support the results of the ENRY study

Radioembolization or Selective Internal Radiation Therapy (SIRT)

What is radioembolization or Selective Internal Radiation Therapy (SIRT)?
Radioembolization, also known as *Selective Internal Radiation Therapy* or SIRT, is an innovative therapy that has been developed for the treatment of unresectable primary and secondary liver cancer. The technique involves infusing up to 30 million radioactive beads (Yttrium-90 resin microspheres) into the arterial blood supply of the liver.

What are SIR-Spheres microspheres?
SIR-Spheres are radioactive microspheres used in SIRT. SIR-Spheres deliver targeted internal radiation therapy directly to the tumour(s) with a dose of internal radiation up to 40 times higher than conventional radiotherapy, while sparing healthy tissue.

Direct delivery of SIR-Spheres via the hepatic arteries helps to achieve maximum disease control through optimal tumour coverage. Randomised controlled trials in patients with liver metastases from colorectal cancer have demonstrated that radioembolization using SIR-Spheres significantly increases the tumour response or disease control rates, as well as significantly extending the time to progression and overall survival.

How do SIR-Spheres microspheres work?
The SIRT procedure enables radiation to be targeted directly into the liver tumours by using the tumour's own blood supply. Healthy liver tissue derives up to 90% of its blood supply from the portal vein (the vein that delivers nutrients to the liver from the gut), with only a small amount of the blood supply being derived from the hepatic artery. In contrast, liver tumours derive up to 90% of their blood supply from the hepatic artery, since they need a profuse supply of highly oxygenated blood. The hepatic artery therefore provides an ideal channel to deliver targeted treatment to the tumour.

SIR-Spheres are approximately 32 µm (microns) in diameter which means that following infusion, they are small enough to become lodged in the arterioles within the growing rim of the tumour(s) where they emit a high dose of radiation, but are too large to pass through the capillaries and into the venous system. As SIR-Spheres are targeted directly at the liver tumours via the hepatic artery, exposure to the remaining healthy liver tissue is minimised. SIR-Spheres contain the radioactive element Yttrium-90, which delivers beta radiation over a relatively short distance: an average of 2.4 mm in human tissue and a maximum of 11 mm. Yttrium-90 has a half-life of approximately two-and-a-half days (64.1 hours), therefore most of the radiation (over 97%) is delivered to the tumour in the first two weeks following treatment.

How are SIR-Spheres microspheres different from conventional radiotherapy?
Radiation is an effective agent for destroying tumours and is widely used in cancer treatment. However, the use of external beam radiation to treat liver tumours is limited by the low radiation doses that can be applied to the liver without the risk of radiation damage to the normal liver tissue.

Unlike conventional external beam radiation, SIR-Spheres selectively irradiate liver tumours and therefore have the ability to deliver more potent doses of radiation directly to the cancer cells over a longer period of time. The therapeutic ratio with SIRT, compared to external beam radiotherapy, is significantly improved and the tumour-absorbed doses from SIRT are typically 4 to 6 times higher than those to the healthy liver tissue.

How is SIRT administered?
Under local anaesthetic, the specially trained interventional radiologist makes a small incision, usually into the femoral artery near the groin. A catheter is then guided through the artery into the liver. The SIR-Spheres are administered through this catheter. The whole procedure may take around 60–90 minutes. After the procedure is completed, patients may be sent to have a scan to check the level of radioactivity of the SIR-Spheres in the liver. Patients will be monitored for a few hours after the procedure and most patients are discharged within 24 hours.

What is the regulatory status of SIR-Spheres microspheres?
SIR-Spheres are approved for use in Australia, the European Union (CE Mark), New Zealand, Switzerland, Turkey and several other countries for the treatment of unresectable liver tumours.

SIR-Spheres are also fully FDA-approved and are indicated in the U.S. for the treatment of non-resectable metastatic liver tumours from primary colorectal cancer in combination with intra-hepatic artery chemotherapy using floxuridine.