4.67.1 Holmium isotopes in medicine

Radiosynovectomy with $^{166}$Ho-radiopharmaceutical agents can be used for treatment of arthritis. The half-life of $^{166}$Ho is 1.1 days. $^{166}$Ho ferric hydroxide macroaggregate ([$^{166}$Ho] FHMA) radiosynovectomy is being used because FHMA minimizes extra-articular (outside a joint) leakage of the radioisotope [469, 470]. $^{166}$Ho has been used for radioimmunotherapy (RIT) with labeled antibodies [471]. The $^{166}$Ho-chitosan complex (a linear polysaccharide, which is a long-chain molecule like cellulose that is used by the body for energy storage) is being used...
for hepatic (liver) cancer therapy [472]. $^{166}$Ho-labeled radiopharmaceuticals have been used for alleviating pain from bone metastases [440, 470, 473].

$^{166}$Ho microspheres have been used for intra-arterial radioembolization (treatment where radioactive particles are delivered to a tumor through the bloodstream) of liver metastases (Figure 4.67.1) [472]. $^{166}$Ho is paramagnetic and emits both beta and gamma radiation, which makes it ideal for radioembolization. These properties also enable the distribution of $^{166}$Ho microspheres to be visualized with **magnetic resonance imaging** and **single-photon emission computed tomography** (SPECT) [472].

The $^{166}$Ho-Patch is a specially designed radioactive skin patch that is used for external radiation of superficial skin cancers and Bowen’s disease in areas that are sensitive and difficult to treat by methods that are more destructive and have poor cosmetic results (i.e. areas of the face) [474, 475].

**Fig. 4.67.1:** Schematic overview of the administration system for $^{166}$Ho-RE (radioembolization) [472]. The administration system consists of the following components: iodine contrast agent (Visipaque®, GE Healthcare) (1), saline solution (2), 20-ml syringe (Luer-Lock) (3), three-stopcock manifold (4), one-way valve (5), inlet line (6), administration vial containing the $^{166}$Ho-poly(L-lactic acid) microspheres (7), outlet line (8), flushing line (9), Y-connector (10) and catheter (11). (Copyright permission will be purchased through Copyright Clearance Center once publication is approved.)