Radiation synovectomy
Synovectomie radioisotopique
Radiatie synovectomie
Yttrium 90 and Rhenium 186 replaced for years 198 Au colloids

\[ ^{186}\text{Re} \]: less energetic Gamma and Beta decay: reduce unwanted radiation exposure

\[ ^{90}\text{Y} \]: greater Beta penetration and absence of Gamma radiation

\[ ^{169}\text{Er} \] (169 Erbium): introduced later on the basis of weaker Beta penetration: more suitable for the treatment of small joints

Administered in colloidal form (\(< 0.1\) micron)

To maximally avoid extraarticular escape, corticoid injection (before and just after injection of radionuclide) is mandatory

After injection, immobilization

Other available radionuclides: Dysporium 165 (165 Dy), Holmium 166 (166Ho) and Samarium 153 (153 Sm)
Effects of Beta energy

Ideally: energy delivered by Beta ionisation should penetrate the synovial lining but avoid cartilage, bone marrow and skin

For these reasons, radionuclides of different energies are recommended: 90 Y: large joints (knee), 186 Re (intermediate size joints) and 166 Er (small joints)

Doses:

+/- 111MBq (3 mCi) to 185MBq (5 Mci) for 90 Y (hip and knee)

111MBq (3mCi) 186 Re (elbow)

74MBq (2mCi) 169 Er (fingers)
Side effects

Activity may escape from the joint: risk of irradiation of healthy intra and extra-articular tissue (cartilage, bone, ligaments)

Chondrocytes (little mitotic activity): hyaline cartilage relatively resistant. However, ultrastructural changes and metabolic effects have been observed following strongly penetrating 90 Y Beta

Surrounding soft tissues: erythema and (if case of severe irradiation) necrosis of the skin

In case of activity escaping from a joint: colloids can induce irradiation of the liver, the spleen and lymph nodes (risk of lymphocytes damage) To reduce this risk: always inject first contrast under scopy, to ensure the absence of extravasation, followed by injection of corticoids and finally a little flush of corticoids
Radionuclide carrier

Colloids

90 Y Citrate, silicate, ferric hydroxide and resin colloids

186 Re sulfide colloids

169 Er citrate colloids

Optimal size: 10 nm

However: heterogeneity of particle size: often noted induces a patchy Distribution of 90 Y (autoradiography of synovium removed after Radiation synovietomy) and, as a result, patchy synovial tissue necrosis
Efficacy

90 Y injection induces thickening of synovial membrane
increase of cellular infiltrate
thrombotic occlusion of capillaries
increased fibrine deposition

After a few weeks: interstitial fibrous tissue

After weeks to months: decrease of thickness of synovial membrane
reduction of cellular infiltrate
decreased blood vessels, obliteration with perivascular fibrosis and reduction of effusion
EANM guidelines concerning radiation synovectomy using 90Y 186 Re and 169 Er

- Patient selection: avoid treating children and young adults (relative risk of malignancy)
- Patient information
- Precautions needed when injecting: ultrasound or fluoroscopy, guidance, immobilization for 48 hours after injection
- Amount of activity injected and co-injection with long-acting steroids
- Recommended volumes for each joint
- Reporting response and guidance about repeating injections