



Radiation synovectomy
Synovectomie radioisotopique
Radiatie synovectomie

Yttrium 90 and Rhenium 186 replaced for years 198 Au colloids

186 Re: less energetic Gamma and Beta decay: reduce unwanted radiation exposure

90 Y: greater Beta penetration and absence of Gamma radiation

169 Er (169 Erbium): introduced later on the basis of weaker Beta penetration: more suitable for the treatment of small joints

Administered in colloidal form ($\leq 0,1$ 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 synoviectomy) 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 ^{90}Y ^{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