Radiosynovectomy (Radiosynoviorthesis)

What is a Radiosynovectomy?

The radiosynovectomy or radiosynoviorthesis is a nuclear medical procedure for the treatment of painful, chronically inflammatory joint diseases, such as rheumatoid arthritis or activated osteoarthritis (osteoarthritis). Conditions that can be treated with RSO include:

- Activated osteoarthritis (a painful, inflammatory joint disease)
- Chronic polyarthritis (rheumatoid arthritis)
- Psoriatic arthritis (psoriasis with inflammatory joint involvement)
- Joint effusion (“water in the joints”) and effusions after previous joint surgery especially when not responsive to other forms of treatment
- Chronic irritation after implantation of a total endoprosthesis (TEP, artificial joint)
- Inflammatory joint examinations with rheumatoid arthritis
- Hemophilia (hemophilia) – in order to prevent future bleeding especially into the knee joints
- Villonodular synovitis

Whether a radiosynovectomy is appropriate or indicated in your case, will be reviewed as part of a detailed preliminary examination in our practice in conjunction with your rheumatologist or orthopedic surgeon.

Which joints can be treated by a RSO?

In our practice, we can perform radiosynovectomy on all joints outside of the spine, but the joint to be treated must be able to be reached with a puncture needle and a sufficient amount of radioactive liquid (radionuclide) must be able to be placed into the joint itself i.e. can be placed in the joint capsule.

How is a radiosynovectomy performed?

The RSO can be an outpatient procedure performed in our practice. The radioactive source is ordered from our suppliers and can be delivered only on certain days (these will be communicated to you well ahead of time and all procedures will be scheduled to best accommodate your circumstances and those of the other patients booked simultaneously).

After a disinfection of the skin, the joint will be treated under sterile conditions (sterile gloves, fenestrated drape, sterile disposable needles, disposable sterile syringes – according to universal precautionary measures) by puncturing it with a thin needle and a local anesthetic.

If an effusion exists, it is aspirated (drawn out). It is important that the radioactive substance will be injected into the joint cavity safely, so that healthy tissue is not destroyed. For this reason, immediately before injection of the radioactive substance (except knee joint) a fluoroscopy is made with a contrast medium. Where this is not available, needle placement is confirmed by direct visualization under ultrasound guidance. In this way, the correct position of the injection needle into the joint can be checked for the correct position.

The radioactive substance prepared for you, will be injected into the joint, usually in conjunction with low cortisone to avoid irritation and limit the amount of inflammation. The needle is pulled back out, the puncture site sealed with a plaster bandage.

For 48 hours immediately after treatment, it is necessary to immobilize (keep the joint still) the joint completely with a splint since this allows for preventing any drainage from the injected joint space via the lymphatics. However, strict bed rest is not necessary.

Next, the correct distribution of the radioactive substance is measured in the joint by means of a gamma camera scan (with the exception of the small
joints) and recorded with a distribution scintigram. Following the scan a thrombosis prophylaxis (preventive measures for blood clot) should be performed based on individual risk. If you have received treatment of hip, knee, or ankle in our practice, you will be taken by us in a wheelchair to the car.

**How does a RSO work?**

After the injection of an appropriate radioactive substance (radionuclide) into the joint, there is a uniform distribution of the fluid in the joint space. The substances are bound to tiny protein particles (colloids) and only the superficial cells of the inflamed synovial membrane inside the joint (synovium) are targeted, which assures that only here the desired effect takes place.

The radiation now triggers an additional inflammation inside the mucosal cell, which causes the superficial, thickened (hypertrophied) cell layers to be destroyed – in other words, we fight fire with fire. The cartilage will not be damaged in this procedure. The irradiation is mainly restricted to the synovial membrane since the radioactive substances used only has a maximum radiation range (over which it acts) of only few millimeters in tissue – each type of radionuclide used determines the range over which it is effective and what joints it can be injected. What type of radionuclide is used depends on the size of the joint: Yttrium-90 is used for the knee joint, the shoulder joint, and medium-sized joints such as the elbow or ankle; rhenium-186, for small joints such as finger or toe joints we use erbium-169.

The thickness of the synovial membrane changes depending on the size of the joint. In order to achieve a sufficient radiation effect, various radioactive substances (radionuclides) are used. These differ in their depth of the radiation penetration in the tissue by their half-life and by their emitted radiation energy. All three nuclides are beta emitters and cannot make it through the skin i.e. safe to those around you.

Over time there is a gradual rind-like healing (fibrosis and sclerosis) of the mucosal surface and a decrease of the inflammatory activity of the synovial membrane. As a result, the pain is reduced or eliminated and the joint function is improved. The effect is usually felt within weeks, but sometimes it takes 3 to 6 months. The final effect can in most patients be judged after about 6 months. It there is not a significant improvement after six months, a second treatment will be discussed. Most patients demonstrate response within two treatments. In some patients the response is only partial, but does allow for them to take fewer pain medications, which is also a benefit.

**What preliminary examinations are required prior to performing an RSO?**

Before a radiosynovectomy can be performed successfully, there will be a special nuclear medicine investigation. Once you have submitted your information about your disease and the symptoms (history), the implementation of a 3-phase scintigraphy of the joints is usually required. With this type of assessment inflammation in a joint or surrounding tissue can be represented very accurately (with high sensitivity), often months before symptoms and changes are visible on normal x-rays.

The first phase demonstrates whether there is increased blood flow to the joint, which is usually increased in active inflammation. The second phase at 10 minutes after the tracer have been injected looks at the soft tissue leakage as a result of the inflammation. It provides important information about the localization and extent of the joint inflammation and provides important information for planning the following synovectomy. In the third phase (late recording), the entire skeletal system can be represented in about two to three hours after the tracer injection. Apart from valuable secondary information, this allows us to accurately distinguish between inflammatory (arthritis) and bony degenerative (osteoarthritis).

If necessary, the preliminary assessment is supplemented (and usually is) by an ultrasound examination of the joints. In conjunction with all other findings, the nuclear medicine physician decides together with the patient, whether a synovectomy is useful and necessary.

Please bring on this date any existing X-ray, CT and MRI images (MRI) and other findings, so that they can be incorporated into the overall assessment. At the same time this will help to avoid unnecessary duplicate examinations.

**Ultrasound examination of the joints (musculoskeletal sonography):**

Depending on the condition of the affected joints, it is necessary to perform an additional ultrasound. Routinely the musculoskeletal sonography is used to
determine especially diseases of the knee joint, for example, joint effusion, abnormal swellings of the joints, and protrusions of the mucosa joint cavity of the knee (Baker’s cyst). In special cases, such a cyst should be aspirated even before the administration of radio-synoviotherapy to avoid a burst (rupture) of the cyst.

**Detailed discussion:**

At the end of the study, the findings are collected and the nuclear medical treatment options are discussed with you in a personal interview. You will be informed about the method of treatment, the possible side effects of radio-synoviotherapy including the necessary intra-articular punctures and injections, as well as the need for immobilization of the joint to be treated.

**What are the side effects?**

Any effect may principally be associated with side effects. However, these usually occur only rarely:

- Infection (septic arthritis)
- Local haemorrhage
- Extravasation
- Lymphedema (swelling)
- Acute crystal synovitis
- Extra-articular radionecrosis (ulcer formation as a result of exposure to radiation)
- Radiodermatitis (skin inflammation as a result of radiation exposure)
- Risk of second malignancy (theoretical only) e.g. lymphocyte chromosomal aberrations; chronic myeloid leukaemia
- Post injection pyrexia (fever)
- Post injection allergy
- Risk of thromboembolism (blood clot formation that may shoot off to the lungs)

**When may RSO not be performed (contraindications)?**

**Absolute contraindications:**

- Pregnancy and lactation
- Suspected bacterial joint infection
- Local infections and skin diseases in the vicinity of the injection site
- Massive bleeding into the joint
- Ruptured Baker’s cyst of the knee

**Relative contraindications:**

- Use in children and adolescents and young adults under the age 20
- Baker’s cyst of the knee joint with valve mechanism
- Advanced joint and bone destruction with joint instability

**What are important measures after a radiosynovectomy?**

The joint is treated e.g. with a splint or sling (shoulder), sometimes by a thick gauze dressing (finger joints) and the patient may be sedated for 48 hours. A treatment of the joints of the lower body (hip, knee, ankle, and toe joints) means that the relevant limb may not be loaded i.e. used excessively (or only slightly loaded) 48 hours after the treatment, i.e. the stress should be limited mainly to using the toilet. Patients with increased risk will be administered a thrombosis prophylaxis (blood clot prevention) with Clexane® or heparin.

In case the bandage applied by us should press onto the joint or cause pain, you can remove it and apply again yourself. Joints that were not treated can be moved normally.

After 48 hours, the radioactive substance is well fixed in the synovial membrane. Immobilization is now no longer required. The splint/sling or bandage can now be removed.

Uncommon side effects can set in during the first few weeks such as increased pressure sensation with swelling, warmth or tingling or stinging in the treated joint. These symptoms can easily be relieved with cold compresses or even a period of immobilization.

An additional cortisone injection at the time of the RSO may temporarily increase the blood sugar (diabetes mellitus), so that the insulin dose may have to be increased. Another cortisone effect can be felt by a “flush” (burning redness of the face). Occasionally, it also causes a rise in blood pressure. Both symptoms usually disappear within a few days without a specific therapy or may be treated in some cases with an antihistamine.

If, contrary to all expectations, there is an increased discomfort, we ask that you first contact us or your family doctor, your rheumatologist or orthopedic surgeon.

In the first week after treatment you should not stress the treated joint and avoid sports or physiotherapy.
**What are the results of the RSO?**

The effectiveness of the radiation synovectomy is well documented in many clinical studies. It can be reliably assessed due to the usually slow onset of effect after several months.

Approximately 50-80% of patients report a subjective improvement of painful symptoms with a decrease of the inflammatory symptoms after about 3-4 months. It is also important to know that in patients with osteoarthritis (degenerative joint disease) the inflammatory symptoms and pain can be relieved. Osteoarthritis as such cannot be cured by synovectomy.

In patients with rheumatism the cause cannot be cured, but the painful symptoms and the inflammation can be relieved. Oftentimes the response to treatment may only be a partial one – this may, however, allow for the use of fewer pain medications, each having its own set of negative side-effects.

**What else should you know as a patient before having a synovectomy?**

Where medical schemes do not readily reimburse for the procedure, all attempts will be made to motivate for it through the relevant channels. At any stage you have the option of paying for the procedure yourself.

Appointments for a preliminary examination may be through a referring specialist rheumatologist or orthopedic surgeon.

The therapy or radiosynovectomy can be performed only on certain weekdays. The radioactive substances are expensive. They are individually ordered for you from our suppliers (often from international sources) and delivered with the right dose on the day of the treatment. It is therefore very important that you keep your appointment. If you cannot keep your appointment, we ask you to cancel it at least one week in advance failing which you will be billed directly for the radioisotope – medical schemes do not reimburse for procedures not performed.

When you come for treatment, please wear very loose and comfortable clothing since it is difficult to apply knee braces in narrow tube pants.

On the day of treatment, and during the first 48-hour of immobilization you may not operate a motor vehicle. You do need a driver for returning home. The time spent in the facility for the treatment is approximately one hour, the treatment itself takes only a few minutes.

**What are the radiation risks involved?**

Nuclear medicine procedures are generally safe. Your doctor should have discussed the treatment you are having with you, and will have considered the benefits of having or not having the therapy, before sending us your referral form. However, if you have any questions at all, please do not hesitate to ask us.

Every day we live with all types of risk; this could be from travelling by road, rail or air, smoking a cigarette or using an electrical appliance. There is even a risk from background radiation depending on where we live.

**Risks from radiation**

There is a 1 in 10,000 chance of dying from a road traffic accident and this is considered very rare. Exposure to any type of radiation increases the risk of getting cancer. This includes naturally occurring radiation. Radiation dose (an amount of radiation) is measured in 'milliSieverts' (usually abbreviated to ‘mSv’) and we naturally receive between 1.5mSv and 7.5mSv from the sun and our surroundings, depending on where we live. This is known as the average level of annual background radiation. Amount of radiation we can give in hospital tests is regulated by radiation protection authorities. We evaluate and test each radiation exposure and give the minimum amount to produce an effective test result. We give substantially less than our colleagues in the USA.

**Your treatment**

Nuclear medicine uses radioactivity to help diagnose and treat medical conditions. Risk for developing a cancer is relatively low, for example in cancer treatment an average dose of 7.4 GBq (very high dose) has an ‘effective dose’ of 20mSv which gives a predicted lifetime risk of developing a cancer by 1 in 1000. Now compare this to the lifetime risk for developing cancer on its own – 1 in 2.32. This would mean you have to do 430 odd cancer treatments before you have the same random lifetime risk for developing a malignancy.

The doses administered in radiosynovectomy are far far less than those for thyroid cancer treatment. In fact the amount of radiation is closer to that of ordinary nuclear
medicine scans, which isn’t high at all. The type of radiation differs, which is why it has an effect.

If you are concerned and/or your test is not identified we will be happy to discuss this with you when you attend for your test and provide an exact value. Alternatively, see contact details and give us a call.

What damage can be expected if any?

As with all radiation, there is a theoretical risk of causing tissue damage. When this damage occurs in the DNA or chromosomes, the risk of a mutation in these regions is increased. Such mutations in a developing fetus can cause organ abnormalities or irreparable damage and if early enough with high enough radiation dose can even cause fetal death.

Similarly DNA damage may also lead to mutations that can cause cells to divide unchallenged. This is how cancer develops. The risk again is minimal with scans and only becomes a problem at increased activity associated with radiation treatment.

For this reason, and for safety purposes, all female patient suspected of being pregnant or uncertain will be tested. For therapy patients, the benefit will be weighed against the risk and discussed with the patient.

Will I be a danger to my family?

Since the activities involved in radiosynovectomy are so low and since the radio-isotopes predominantly emit beta particles that cannot pass through the skin, the amount of exposure to your family is minimal. It is still important to practice good radiation hygiene when using the toilet (how the radiation is excreted) i.e. flush three times and urinate sitting.
Our Contact Details

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