Introduction

There is a clear relationship between recurrent joint bleeding, synovitis, and arthropathy in patients with hemophilia. Synovitis is inflammation of the specialized connective tissue lining of a joint cavity. The golden moment in treatment is when no associated arthropathy is present, because synovitis and muscular hypotrophy are reversible; in contrast arthropathy is not a reversible process [1,2].

Definition

Radioactive synoviorthesis is radionuclide therapy of joint synovitis by intra-articular injection of $^{90}$Y silicate/citrate, chromic phosphate – $^{32}$P or $^{186}$Re sulphide.

Radiopharmaceuticals

The properties of the radiopharmaceuticals that can be used [3, 4, 5] are summarized in Table 13.1 and the lists below.

$^{32}$P:
- Is a pure beta particle emitter with a maximum energy of 1.71 MeV.
- Has a mean energy of maximum beta penetration in tissue of 7.9 MeV.
- Has a mean beta penetration of 2.2 mm with no gamma emission.
- Has a physical half-life of 14.3 days.

$^{186}$Re:
- Is a beta particle with a maximum energy of 0.98 MeV, and a 9% abundant gamma emission with a photopeak of 0.137 MeV.
Table 13.1 Radiopharmaceuticals that can be used

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>Maximum beta energy (MeV)</th>
<th>Gamma emission, % (KeV)</th>
<th>Tissue range (mm)</th>
<th>Half-life (days)</th>
<th>Activity (MBq)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Maximum</td>
<td>Mean</td>
<td></td>
</tr>
<tr>
<td>$^{90}$Yttrium</td>
<td>2.26</td>
<td>11.0</td>
<td>3.6</td>
<td>2.7</td>
<td>185–250</td>
</tr>
<tr>
<td>$^{186}$Rhenium</td>
<td>0.98</td>
<td>9 (137)</td>
<td>3.7</td>
<td>1.2</td>
<td>37–185</td>
</tr>
<tr>
<td>$^{188}$Rhenium</td>
<td>2.1</td>
<td>15 (155)</td>
<td>11.0</td>
<td>3.8</td>
<td>148–703</td>
</tr>
<tr>
<td>$^{32}$Phosphorus</td>
<td>1.71</td>
<td>7.9</td>
<td>2.6</td>
<td>14.3</td>
<td>11–74</td>
</tr>
</tbody>
</table>

- Has a mean energy of 0.349 MeV.
- Has an average penetration range of 1.2 mm.
- Has a physical half-life of 3.7 days.

$^{188}$Re:
- Is a beta particle with a maximum energy of 2.1 MeV, and a 15% abundant gamma emission with a photopeak of 0.155 MeV.
- Has a mean energy of 0.349 MeV.
- Has an average penetration range of 3.8 mm.
- Has a physical half-life of 0.7 days.

$^{90}$Y:
- Is a beta particle with a maximum energy of 2.26 MeV.
- Has a mean energy of 0.935 MeV.
- Has an average soft tissue range of 3.6 mm.
- Has a physical half-life of 2.7 days.

**Recommended Activity**

Table 13.2 shows recommended activity for the knee and elbow.

Table 13.2 Recommended activity (MBq)

<table>
<thead>
<tr>
<th>Joints</th>
<th>$^{90}$Yttrium</th>
<th>$^{188}$Rhenium</th>
<th>$^{32}$Phosphorus</th>
<th>$^{186}$Rhenium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee</td>
<td>185 (285)</td>
<td>518</td>
<td>37</td>
<td>185</td>
</tr>
<tr>
<td>Elbow</td>
<td>111</td>
<td>300</td>
<td>22</td>
<td>111</td>
</tr>
</tbody>
</table>

- Children 2 to 6 years old: use one-third the activity for an adult.
- Children 6 to 10 years old: use half the activity for an adult.
- Children 10 to 16 years old: use three-quarters the activity for an adult.