Re-188

Dose Rate in Intravascular Radionuclide Therapy Using Re-188 Coated Balloon

,

(PTCA)

.   ,

                                                                                              .

Re-188

                                                                            .   EGSnrc

3 mm   ,   20 mm, 30 mm

            .   (Poly Urethan)   0.01 mm   Re-188   .

                                                            , 3   18Gy

                          0.5 mm, 1.0 mm   . 20

mm   18 Gy   0.5 mm, 1.0 mm   19.3

mCi, 33.6 mCi   , 30 mm   27.8 mCi, 48.3 mCi   .

Abstract

Restenosis is the major drawback problem after percutaneous transluminal coronary angioplasty (PTCA). In order to reduce the restenosis, radionuclide therapy has been used, and these day balloon coating method with radionuclide is investigating to effective therapy. We intend to calculate the activity by Monte Carlo method, which is needed in the investigation of coated balloon using Re-188. We used EGSnrc code system to calculate this activity. Balloons were assumed be a length of 20 mm or 30 mm and to have a central catheter of diameter 0.5 mm. The surface of balloon is coated with 0.01 mm depth Re-188 using poly urethan. We calculated dose distribution as radial distance from the surface of balloon. And we calculate how much activities are needed to irradiate 18Gy at the 0.5 mm, 1.0 mm distance from balloon surface during 3 minutes. As results it is needed 19.3 mCi and 33.6 mCi

relatively for each 0.5 mm and 1.0 mm in the 20 mm balloon. It is need 27.8 mCi and 48.3 mCi in the 30 mm balloon. Recent report for Ho-166 using EGS4 suggests 13.04 mCi at 0.5 mm distance in the 20 mm balloon. This value is lower than our result for Re-188 for the same size balloon. It is considered to be a systemic difference between two simulation codes (~10%).
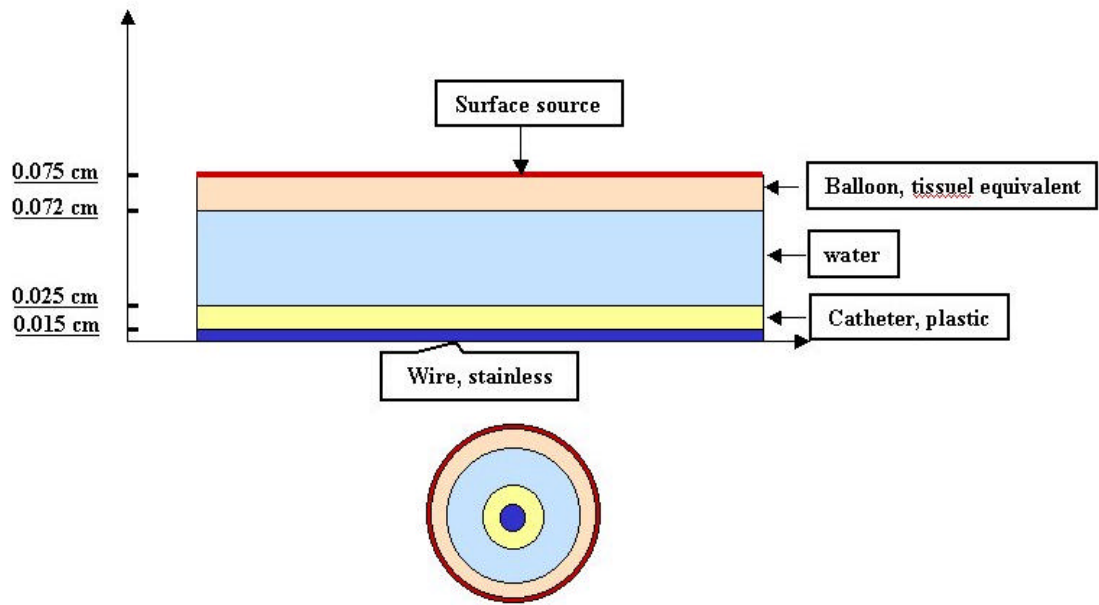
1.

.[1)]

.   ,   Ho-166

.[2)]   Re-188

,   Re-188

,

.[3)]   Re-

188   ,

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2.

Re-188   EGSnrc   [4)]

20 mm, 30 mm   3mm   .   1

0.5 mm   ,   0.03 mm

(Poly Urethan)   0.01 mm   Re-188   .

0.1 mm   ,   1 mm

1   .   0.1 mm

.   3

18Gy   0.5 mm, 1.0 mm

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1. **(Poly Urethan)** **Re-188**

Element	Wire	Catheter	Water	Soft tissue	Urethan
H	--	8.88	11.2	10.45	7.92
C	0.1	--	--	22.66	40.44
N	--	--	--	2.49	15.72
O	--	76.61	88.8	63.52	35.72
Na	--	--	--	0.112	--
Mg	--	--	--	0.013	--
Si	--	--	--	0.030	--
P	--	--	--	0.134	--
Ba	--	11.78	--	0.134	--
S	--	2.74	--	0.204	--
Cl	--	--	--	0.133	--
K	--	--	--	0.208	--
Ca	--	--	--	0.024	--
Cr	19.0	--	--	--	--
Fe	71.9	--	--	0.005	--
Ni	9.0	--	--	--	--
Zn	--	--	--	0.003	--
Rb	--	--	--	0.001	--
Zr	--	--	--	0.001	--
Density(g/cc)	7.80	1.64	1.00	1.04	1.10

3.

　　　　　　　　　　　 20 mm, 30 mm 　　　　　　　　　　 0.01 mm

　　　　，　　　　　　　　　　　　　　　　　　　　　　 .　　　　　　　 2

　　　　 .　　　　 18Gy 　　　 3 　　　　　　　　 0.5 mm, 1.0 mm

　　　　　　　 20 mm 　　　　　　　　　　　 19.3 mCi, 33.6 mCi 　 ,

30 mm 　　　　　　 27.8 mCi, 48.3 mCi 　　　　　 .

2. EGSnrc (Gy/d)

Distance (mm) \ Length (mm)	20	30
0.05	3.27E-10	2.38E-10
0.15	2.40E-10	1.71E-10
0.25	2.01E-10	1.40E-10
0.35	1.72E-10	1.19E-10
0.45	1.49E-10	1.04E-10
0.55	1.31E-10	9.14E-11
0.65	1.17E-10	8.14E-11
0.75	1.04E-10	7.29E-11
0.85	9.37E-11	6.54E-11
0.95	8.46E-11	5.89E-11
1.05	7.65E-11	5.32E-11
1.15	6.95E-11	4.81E-11
1.25	6.32E-11	4.36E-11
1.35	5.75E-11	3.96E-11
1.45	5.24E-11	3.61E-11
1.55	4.75E-11	3.29E-11
1.65	4.32E-11	2.98E-11
1.75	3.91E-11	2.70E-11
1.85	3.53E-11	2.44E-11
1.95	3.17E-11	2.19E-11
2.05	2.80E-11	1.93E-11
2.15	2.34E-11	1.61E-11

4.

Re-188

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5.

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2)   ,   ,   ,   Ho-166 coated balloon   . 38
                              (1999)

3) Almos H I, Reinstein LE, Weinberger J. Dosimetry of a radioactive coronary balloon dilatation catheter for treatment of neointimal hyperplasia. *Med Phys* 1996;23:1783-1788.

4) Kawarakow I., Rogers D. W. O. The EGSnrc Code System: Monte Carlo Simulation of Electron and Photon Transport. NRCC Report PIRS-701, 2000.