Experimental evaluation of the use of solid bonded aquaplast thermoplastic as a bolus material

Rudolph Woode, Yunsil Ho, Tracey Butler, Steven Bhatia, Allen Shih, Sou-Tung Chiu-Tsao, Louis Harrison

Beth Israel Medical Center and St. Luke's Roosevelt Hospital Center, New York, NY

A new type of bolus material based on bonded aquaplast thermoplastic slabs has been introduced. The bonded aquaplast thermoplastic material can be used to create a customized bolus that conforms to skin curvatures and is easy to mold. The objective of this work is to evaluate the radiation characteristics of this new material as compared with polystyrene and superflab. A series of measurements were performed, using a Holt parallel plate ion chamber on a stack of polystyrene, with two thicknesses of aquaplast thermoplastic, polystyrene and superflab bolus. They were performed with various electron and photon beams, in an attempt to show similarities and the equivalence to soft tissue in radiation interaction. Each of the three materials of nominal thicknesses of 0.5 cm and 1.0 cm was placed above the chamber and irradiated with 6 MV photon and 6 MeV, 9 MeV and 12 MeV electron energies with a 10 cm x 10 cm field size at 100 SSD. The ratios of the ion chamber readings of the aquaplast thermoplastic and superflab to polystyrene were determined and tabulated. They are all within 2%. We conclude that the radiation characteristic of aquaplast thermoplastic bolus material is similar to polystyrene and superflab. Aquaplast thermoplastic thus, proves to be effective as bolusing material.

Summary of Measurements

Nominal Thickness cm	Energy	Ratio of Aquaplast Thermoplastic to Polystyrene	Ratio of Superflab to Polystyrene
0.5	6 MV	1.01	1.00
	6 MeV	1.02	1.01
	9 MeV	1.01	1.00
	12 MeV	1.00	1.00
1.0	6 MV	1.00	0.99
	6 MeV	0.98	1.00
	9 MeV	1.01	1.00
	12 MeV	1.01	1.00

As submitted to AAPM for 2002 poster presentation

Aquaplast RT™ Bolus - Electron Readings

The following attenuation data was offered to us by a generous customer who collected the data in the course of treatment planning. WFR/Aquaplast Corp. is not able to validate or check the accuracy of the data, but is presenting it as received, in response to numerous requests for attenuation data on our bolus materials. Please consider the data as a starting point for further testing in your own facility.

Readings at 4MEV with .48cm Aquaplast RT™ bolus

4MEV @ Dmax	
Cone Size	Avg. Readings
6x6	1.7912
6x10	1.6946
10x10	1.9866
15x15	2.005
20x20	2.076

4MEV @ Surface
0.48cm Avg. Reading
1.7521
1.6605
1.9543
1.9727
2.028

4MEV Surface to Dmax Ratio
0.48cm
0.978
0.980
0.984
0.984
0.977

Readings at 4MEV with .64cm Aquaplast RT™ Bolus

4MEV @ Dmax	
Cone Size	Avg. Readings
6x6	1.7912
6x10	1.6946
10x10	1.9866
15x15	2.005
20x20	2.076

4MEV @ Surface
.64cm Avg. Readings
1.7842
1.6938
1.9692
1.9863
2.061

4MEV Surface to Dmax Ratio
0.64cm
0.996
1.000
0.991
0.991
0.993

Readings at 6MEV with .96cm Aquaplast RT™ Bolus

6MEV @ Dmax	
Cone Size	Avg. Readings
6x6	2.018
6x10	1.897
10x10	2.082
15x15	2.062
20x20	2.085

6MEV @ Surface
0.96cm Avg. Readings
1.998
1.8724
2.062
2.034
2.055

6MEV Surface to Dmax Ratio
0.96cm
0.990
0.987
0.990
0.986
0.986

Readings at 9MEV with .96cm Aquaplast RT™ Bolus

9MEV @ Dmax	
Cone Size	Avg. Readings
6x6	2.038
6x10	2.033
10x10	2.065

9MEV @ Surface
0.96cm Avg. Readings
1.923
1.915
1.951

9MEV Surface to Dmax Ratio
0.96cm
0.944
0.942
0.945

Energy	Dmax
4MEV	0.6
6MEV	1.2
9MEV	2

WFR/Aquaplast Corp. 30 Lawlins Park, Wyckoff NJ 07481 USA
Tel: (800) 526-5247 or (201)891-1042 Fax: (800) 831-8174 or (201) 891-2329
email: RTsales@WFR-Aquaplast.com www.WFR-Aquaplast.com