



Applications

Simplified application of IMRT to breast treatments

Accurately repeats both shape and position, treatment after treatment

Reduces dose to the lungs, heart and ribs



Modalities

Intensity-Modulated Radiation Therapy (IMRT)



The Treatment Brassiere dependably delivers a more uniform dose every time. It reshapes the ipsilateral breast more favorably for radiation treatments and repositions the contralateral breast away from the beams. A full brassiere library of 40 cups is available in a portable caddy for convenient, organized fitting of nearly all patients.

Data on increased skin dose due to the ipsilateral cup were submitted to the FDA. These data provided a comparison of skin dose increased by the Treatment Brassiere with the increase found for various thermoplastic positioning devices on the market. The skin dose due to the cup material (0.50 mm thick for small cups to about 0.63 mm thick for very large cups) was found to be substantially less than for other positioning devices. The FDA has issued a 510 (k) Marketing Clearance for the Treatment Brassiere.

Cup Selection: Cups are divided into four groups corresponding to small thoraxes (chest breadths from 27 to 32 cm), medium thoraxes (32 to 36 cm), large thoraxes (36 to 42 cm), and extra-large thoraxes (over 42 cm).

Begin by measuring a patient's chest breadth when supine and wearing her clothing brassiere. This indicates the group containing the right cup for her. The cups of the group (five each for left or right) are removed from the Treatment Brassiere Caddy and the cup making the best fit is selected. (Clothing Brassiere sizes cannot be used for cup selection because of poor correlation between clothing brassiere sizes and breast volumes.)

Cup Size*	Observed Volume
A	94 – 225 ml
B	146 – 458 ml
C	267 – 835 ml
D	499 – 1,120 ml
DD	988 – 1,427+ ml
DDD	2,765 – 3,176 ml

*Data as reported by 75 models. Some cup volumes shown are altered from other cups as required for continuous gradation.

Model Numbers

Model No.	Product Description
BR-100-TBC	Basic Brassiere Library with Caddy, 40 different cups
BR-100	Basic Brassiere Library without Caddy, 40 different cups
BR-100S	Small Group, breast volume to be specified
BR-100M	Medium Group, breast volume to be specified
BR-100L	Large Group, breast volume to be specified
BR-100XL	Extra Large Group, breast volume to be specified

Specifications

Packing Size	Packing Weight
25W x 25D x 25H	1 kg
10W x 10D x 10H in	2 lb.

Soft Tissues: There are unlimited, small variations in density and absorption throughout the human body. Phantom soft tissue is closely controlled to have the average density of these tissues.

Skeletons: RSD skeletons are highly detailed polymer moldings which reproduce the shape, mass density and attenuation coefficients of cortical bone and spongiosa. RSD's proprietary moldings allow for continuous production, eliminate the restrictions of human skeleton bones (including limited availability, unethical collection of human bone specimen, variable size, and uncertain chemical composition), and avoid the loss of marrows in dried natural skeletons thereby making RSD skeletons superior to "real bone."

Molds: Molds for the RSD cortical bone and spongiosa were made from human skeletons consistent with the sizes of the soft tissue molds.

ICRU 44: RSD skeletons conform closely to the standards established by the International Commission on Radiation Units and Measurements ([ICRU Report No. 44](#)); mass density is reduced slightly to take into account a small decrease in calcium content for older patients.

LINEAR ATTENUATION DATA

1. Monte Carlo simulation was used to calculate linear attenuation coefficients as a function of beam.
2. Monte Carlo results were validated with linear attenuation coefficients derived from Hounsfield Unit measurements at discreet energy levels.
3. RSD Phantom material linear attenuation data was compared to NIST data using ICRU Report 44 compositions of human tissues.
4. NIST data was interpolated when necessary.

MATERIALS	DENSITY (g/cc)
RSD Soft Tissue (Opaque)	1.08
RSD Soft Tissue (Transparent)	1.10
RSD Cortical Bone	1.83
RSD Trabecular Bone	1.17

RSD SOFT TISSUE					
Energy (MeV)	Mean (HU)	Calculated (M)	μ (ICRU 44)	% Difference	Ratio
00.08	60.30	0.1948	0.1932	0.0080	0.9921
00.10	52.88	0.1797	0.1795	0.0015	0.9985
00.12	57.10	0.1717	0.1709	0.0044	0.9956
00.14	52.95	0.1623	0.1624	0.0007	1.0007
00.20	--	0.1477	0.1439	0.0261	0.9746
00.30	--	0.1245	0.1246	0.0004	1.0004
00.60	--	0.0950	0.0941	0.0101	0.9900
00.80	--	0.0825	0.0826	0.0013	1.0013
01.00	--	0.0744	0.0743	0.0018	0.9982
02.00	--	0.0520	0.0519	0.0018	0.9982
03.00	--	0.0351	0.0357	0.0171	1.0174
06.00	--	0.0288	0.0291	0.0088	1.0088
08.00	--	0.0252	0.0255	0.0098	1.0099
10.00	--	0.0229	0.0232	0.0149	1.0151
15.00	--	0.0203	0.0203	0.0015	0.9985
20.00	--	0.0189	0.0189	0.0017	1.0017

RSD CORTICAL BONE					
Energy (MeV)	Mean (HU)	Calculated (M)	μ (ICRU 44)	% Difference	Ratio
00.08	1365	0.4345	0.4280	0.0151	0.9851
00.10	1048	0.3496	0.3562	0.0184	1.0188
00.12	0977	0.3211	0.3274	0.0191	1.0195
00.14	0902	0.2932	0.2986	0.0180	1.0184
00.20	--	0.2511	0.2513	0.0009	1.0009
00.30	--	0.2155	0.2137	0.0084	0.9916
00.60	--	0.1596	0.1598	0.0011	1.0011
00.80	--	0.1403	0.1402	0.0010	0.9990
01.00	--	0.1274	0.1261	0.0106	0.9895
02.00	--	0.0883	0.0885	0.0017	1.0017
03.00	--	0.0611	0.0625	0.0229	1.0235
06.00	--	0.0512	0.0525	0.0246	1.0253
08.00	--	0.0468	0.0474	0.0120	1.0121
10.00	--	0.0446	0.0444	0.0039	0.9962
15.00	--	0.0410	0.0409	0.0016	0.9984
20.00	--	0.0393	0.0397	0.0102	1.0103

RSD TRABECULAR BONE (SPONGIOSA)					
Energy (MeV)	Mean (HU)	Calculated (M)	μ (ICRU 44)	% Difference	Ratio
00.08	551	0.2849	--	--	--
00.10	515	0.2586	--	--	--
00.12	439	0.2337	--	--	--
00.14	318	0.1541	--	--	--