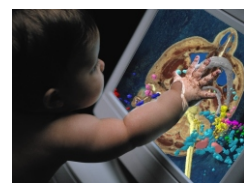# TOPOGRAPHY OF THE LYMPHATICS OF THE BREAST BASED ON THE VISIBLE HUMAN DATASET

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Background and purpose:

The appropriate application of conformal radiotherapy (3-DCRT) and intensity modulated radiotherapy (IMRT) for breast cancer patients requires a standardization of the procedures for the delineation of target volumes (2-4). The scope of the paper is to present the data aquiried by studying the nodal location and topograpical distribution in axial slices in the Visible Human optical datasets (VHODS) that makes a standardization possible.

Materials and Methods:

The location, number and size of regional lymph nodes of the breast were studied by careful investigation of the axial anatomic optical microtome slices of the VH dataset. The lymphatics considered as loco-regional for the breast includes the axillary, the internal mammary chain and the supraclavicular nodes which were identified by the investigation of the VHODS female and male datasets. Visualized were more than 70 lymph nodes as small as 1 - 20 mm.

Results:

The axillary nodes identified were classified conform to the Berg level classification (1) (**Table I**). Thirty-eight left located (23 level I and 15 level II) and thirty-five right located (22 level I and 13 level II) axillary lymph nodes in the visible human male were identified (**Fig. 1**). The axillary nodes identified in the female VHODS are shown in **figure 2**. The Rotter lymph node on the right side was identified. Axillary lymph nodes located lower than the apex of the scapula on each side were visualized (**Fig. 3**). In the visible human female dataset except the axillary lymph nodes, supraclavicular and internal mammary nodes, in breast located lymph nodes were identified (**Fig. 4**). The 3D representation of the axillary and internal mammary identified lymph nodes in the VHODS of the male are shown in **figure 5**.

Table I. The number of lymph nodes identified per level in the VHODS male dataset.

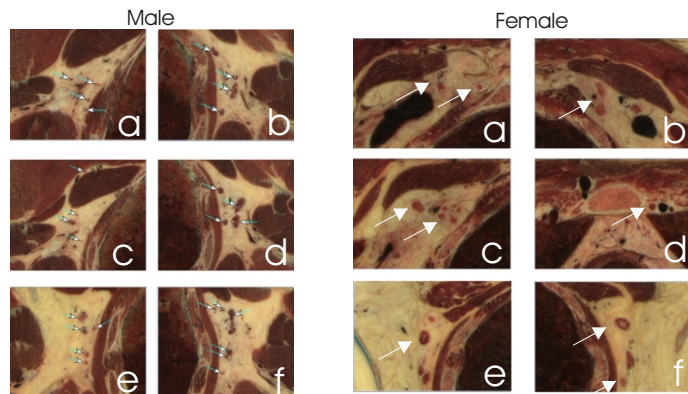| Axillary Nodal Level	Right Side	Left Side
I	22	23
II	13	15
III	0	0
Total	35	38

Male

Female

Figure 1 a - f. The distribution of the most representative right and left located axillary (white head arrows) lymph nodes in the VH male. a), c), and e) the right level I axillary nodes, c) on the right side one Rotter lymph node was identified. b), d) and f) the left level I axillary nodes.

Figure 2 a - f. The distribution of representative right and left located axillary (white arrows) and internal mammary lymph nodes in the VH female: a) one right level III (yellow arrow) and one level II axillary node was identified, b) two level II nodes, c) five level II and one level I (red arrow) nodes, d) one left situated internal mammary node, e) and f) right and left axillary level I nodes.
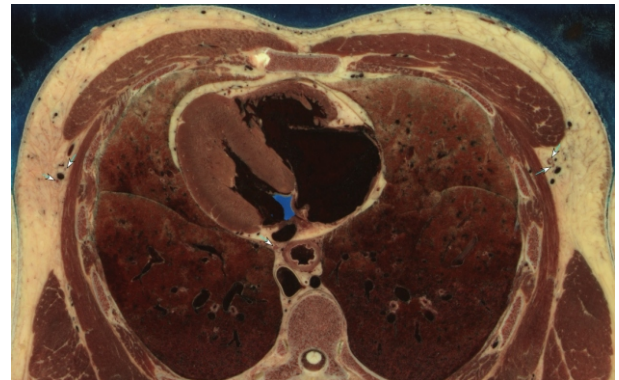

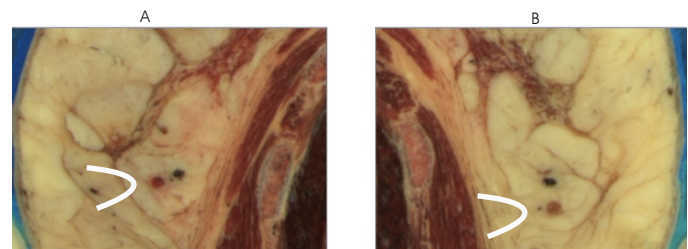**Figure 3.** The identified level I lymph nodes located lower than the apex scapulae on both sides in the male VHODS.

Figure 4. In breast located lymph nodes (white arrow) identified in the VH female dataset: A) right breast and B) left breast.
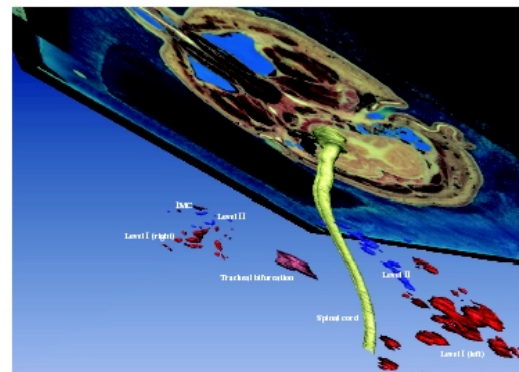

Figure 5. The 3D representation of the axillary, internal mammary lymph nodes identified in the male VHODS on both sides: level I = red, level II = blue, IMC = brown. The spinal cord is shown in yellow. The trachea at the level of carina is pink.

Conclusions:

The topographical distribution of a large number of normal sized lymph nodes of the regional lymphatics of the breast of the male and female VHODS was identified. A 3D representation of the locoregional lymphatics of the breast was performed. These data are of importance for the clinical target volume delineation in radiation oncology.

References:

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