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Table S1. Anatomical boundaries of chest wall and whole breast CTV

	Chest wall	Whole breast
Cranial	Guided by palpable /visible signs; if appropriate guided by the contralateral breast; maximally up to the inferior edge of the sternoclavicular joint	Upper border of palpable /visible breast tissue; maximally up to the inferior edge of the sternoclavicular joint
Caudal	Guided by palpable/visible signs; if appropriate guide by the contralateral breast	Clinical reference; most caudal CT slice with visible breast
Anterior	Skin	5mm under skin surface
Posterior	Include pectoralis muscles, chest wall muscles, excluding ribs	Exclude pectoralis muscles, chest wall muscles, ribs
Lateral	Guided by palpable/visible signs; if appropriate guide by the contralateral breast. Usually anterior to the mid-axillary line, excludes lattices dorsi muscle	Lateral breast fold; anterior to the lateral thoracic artery
Medial	Lateral to the medial perforating thoracic internal vessels; maximally to the edge of the sternum	Lateral to the medial perforating thoracic internal vessels; maximally to the edge of the sternum

Notes: For patients with stage III according to AJCC 8th edition, the posterior of the whole breast can extend to the rib interface.

Table S2. Anatomical boundaries of regional nodal CTV

	Cranial	Caudal	Anterior	Posterior	Lateral	Medial
Medial Supra-clavicular	Caudal to the cricoid cartilage	Junction of brachioceph-axillary veins / Caudal edge of clavicle head	Posterior edge of sternocleidomastoid muscle	Posterior surface of internal carotid artery or anterior surface of scalene muscles	Medial border of clavicle head or 5 mm below the skin surface	Medial border of internal carotid vessels
Lateral Supra-clavicular*	Caudal to the cricoid cartilage	Junction of Brachioceph. -axillary veins. /Caudal edge of clavicle head	Posterior surface of internal carotid artery or anterior surface of scalene muscles	At the trapezius	Medial border of clavicle head or 5mm below the skin surface	At the longus coli
Internal mammary	Junction of Brachioceph-axillary veins.	Cranial side of the 4rd rib (in selected cases 5th rib)	Ventral limit of the vascular area	Pleura	7mm from internal mammary vessels	7mm from internal mammary vessels
Axilla-level I	Below the humeral head	At the point where the pectoralis major inserts on the ribs (around 4th to 5th rib)	At posterior pectoralis major & minor muscles	An imaginary line anterior to the surface of latissimus dorsi muscle, subscapularis muscle and teres major muscle	Cranially up to an imaginary line between the major pectoral and deltoid muscles, and further caudal up to a line between the major	Lateral border of pectoralis minor musle

								pectoral latissimus muscles	and dorsi	
Axilla-level II	Insertion point of pectoralis minor muscle	The caudal border of the pectoralis minor muscle	Pectoralis minor muscle	Anterior border of ribs and serratus anterior	Lateral edge of pectoralis minor muscle	Medial edge of pectoralis minor muscle				
Axilla-level III	Pectoralis minor muscle insert on Coracoid	Axillary vessels cross medial edge of pectoralis minor muscle	Posterior surface of pectoralis major muscle	Anterior border of ribs or posterior border of subclavian or axillary vessels	Medial border of pectoralis minor muscle	Lateral border of clavicle, ribs, junction of brachioceph-axillary veins.				

- Notes:
- 1) The regional nodal CTV target volume should include the medial supra-clavicular, axilla-level III, undissected axilla-level II, and internal mammary lymph nodes.
 - 2) The inclusion of axilla-level I and II in the regional nodal CTV is at the discretion of radiation oncologists based on the clinical treatment indications. The rotter’s nodes are included in the CTV target volume of axilla-level II.
 - 3) For N2, N3, or high-risk N1 patients, it is recommended to include the lateral supra-clavicular nodes in the regional nodal CTV
 - 4) When the tumor is in the inner lower quadrant, the caudal border of internal mammary nodes is recommended to extend to the cranial side of the 5th rib.

Table S3. Tumor bed GTV and CTV contours

GTV	Includes seroma and/or surgical clips
CTV	GTV with a margin of 1 cm in all directions and without exceeding CTV of the whole breast

Abbreviations: GTV=gross tumor volume, CTV=clinical target volume

Table S4. Dosimetric coverage for target volume

Target volume	Requirements
PTV of chest wall/whole breast and RNI	Per Protocol
	D95%>26Gy
	Acceptable variation
	D90%>26Gy
	Per Protocol
	V28Gy <5%
CI for PTV of chest wall/whole breast and RNI	Acceptable variation
	V29Gy <5%
	Per Protocol
	V25Gy >99%
	Acceptable variation
	V24Gy >99%
Tumor bed PTV	Per Protocol
	≥0.95 , ≤2
	Acceptable variation
	≥0.85 , ≤2.5
	Per Protocol
	D95%>36.4Gy
Tumor bed PTV	Acceptable variation
	D90%>36.4Gy
	Per Protocol
	V39Gy <5%
	Acceptable variation
	V40Gy <5%
Tumor bed PTV	Per Protocol
	V35Gy >99%

CI for Tumor bed PTV	Acceptable variation	V34Gy >99%
	Per Protocol	≥0.95 , ≤2.5
	Acceptable variation	≥0.9 , ≤3

Notes:

- 1) When evaluating the treatment plan of chest wall/whole breast with RNI, tumor bed boost doses should not be considered.
- 2) CI=Conformity index, the volume covered by 95% of the prescription dose / PTV volume
- 3) For evaluation of IMRT plan: a) The whole breast CTV is expanded by 5-8mm in three dimensions to form the PTV. The PTV is limited to 5mm below the skin and the surface of the pectoral muscle or chest wall to form the whole breast PTV_eval for IMRT plan evaluation; 2) The chest wall and regional nodal CTV is expanded by 5-8mm in three dimensions to form an integrated PTV; Limit the PTV to the skin as the anterior boundary and the chest pleura as the posterior boundary to form the PTV_eval for plan evaluation.
- 4) For evaluation of proton plan: a) the dosimetric coverage of the CTV is evaluated; b) The chest wall CTV is recommended to retract 5mm from skin; c) If the chest wall is very thin, 3mm can be considered.

Table S5. DVH constraints for OARs

OARs	The ARROW trial		
	Dosimetric parameter	Per protocol	Acceptable variation
Heart for left-sided breast cancer	Mean	<3Gy	<3.5Gy
	V15Gy	<10%	<15%
	V4Gy	<20%	<25%
	N/A	N/A	N/A
Heart for right-sided breast cancer	Mean	<1Gy	<1.5Gy
	V2Gy	<15%	<20%
Ipsilateral Lung	Mean	<7.5Gy	<8Gy
	V4Gy	<45%	<50%
	V10Gy	<30%	<35%
	V15Gy	<20%	<23%
Contralateral lung	Mean	<1Gy	<1.5Gy
	V2Gy	<10%	<15%
Spinal cord	Max	<20Gy	N/A
Ipsilateral Humeral head	Mean	<10Gy	<11Gy

Contralateral breast	Mean	<3.5Gy	<5Gy
Brachial plexus	D0.1cc	<27Gy	<28Gy
Esophagus	D1cc	< 26Gy	< 27Gy
	D 0.01cc	< 27Gy	< 28Gy
Thyroid	Mean dose	< 10Gy	< 11Gy
Skin ring	V2Gy	<10%	<15%

Table S6. The ongoing trials on the one-week regimen for WBI alone and for RNI in early breast cancer

NCT Number	Coun try	Age (years)	Start year	Random ized	Enrolled patients	Reconstru ction	Tumor bed Boost	IMNI	Study group	Control group	Sample size	Primary Endpoint	Status
WBI alone													
NCT0558 6256	Italy	18-99	2021	No	Indicated for WBI	N/A	Optional, SIB of 30Gy/5Fx or sequential 7.6Gy/ 2Fx	N/A	26Gy/5F x/1w	N/A	300	Acute and chronic toxicity	Recruit ing
NCT0531 8274	Mexi co	≥18	2021	Yes	BCS, pTis-T2, N0	N/A	Study group: No boost; Control group: SIB of 48Gy/16Fx in high risk patients	N/A	26Gy/5F x/1w	42.5Gy/16 Fx	72	Local control	Recruit ing
NCT0466 9873	Brazil	50-90	2021	Yes	BCS, unifocal disease, T < 3cm, pN0, negative LVSI, Grade 1-2, margin >	N/A	No	N/A	Group1: 26Gy/5F x/1w for WBI Group2: 26Gy/5F x/1w for PBI	40Gy/15F x/3w for WBI	36	Local recurrence	Recruit ing

					2mm								
NCT05417516	Canada	≥50	2023	Yes	BSC, negative margin, N0	N/A	No	N/A	26Gy/5Fx/1w for PBI	26Gy/5Fx/1w for WBI	910	Local recurrence	Recruiting
RNI													
NCT03788213	India	≥18	2019	Yes	BCS, or after NAC, or mastectomy with pT3/T4 or pN2 or pT0-2pN0-1 with a Cambridge Score of 3 or more	Yes	Study group:SIB of 32Gy/5Fx, or sequential 12Gy/4Fx; Control group: SIB of 48Gy/15Fx, or sequential 12Gy/4Fx	Based on institutional policy	26Gy/5Fx/1w for WBI/Chest wall, and RNI in N+ or after NAC	40Gy/15Fx/3w for WBI/Chest wall, and RNI in N+ or after NAC	2100	Locoregional recurrence rate	Recruiting
NCT04648904	United States	≥30	2020	No	mastectomy with reconstruction; pathologic T0N1a-2a, T1N1a-2a, T2N1a-2a, T3N0-2a, all	Yes	Optional chest wall boost of 5.2 Gy for 1-2 fractions or 2.5 Gy for 1-4 fractions	Not mentioned	26Gy/5Fx/1w	N/A	72	Local and regional recurrences	Recruiting

					M0								
NCT04443413	United States	≥18	2020	Yes	BCS or mastectomy; clinical or pathologic T1-T4c, N0-3, M0; indicated for RNI	Not mentioned	Optional Study group: SIB of 5-fraction; Control group: 4-fraction boost of x-ray therapy	Not mentioned	proton therapy over 5 fractions	x-ray therapy over 25 fractions	146	Complication rate	Recruiting
NCT04228991	Canada	≥18	2021	Yes	BCS or mastectomy; pT3N0, pT1-3N1-2; Or NAC with cT3N0, cT1-3N1-2 and ypT0-3N0-2	No	Not mentioned	Not mentioned	26Gy/5Fx/1w	40Gy/15Fx/3w	588	Lymphedema	Recruiting
NCT04472845	India	≥18	2021	Yes	BCS or mastectomy; pT3-4pN2-3 M0; NAC with clinical stage III or ypN+	Tissue expanders with distant metal ports are allowed	Study group: SIB of 34Gy/5Fx or sequential 8Gy/2Fx/2d; Control group: SIB of	for patients with T3-4 central and inner quadrants	26Gy/5Fx/1w	34Gy/10Fx/2w	1018	Locoregional control	Recruiting

							42Gy/10fx/2w or sequential 8Gy/2Fx/2d	t lesions and patients with N2					
NCT05150535	Egypt	≥45	2021	Yes	BCS or mastectomy; TxN1-3M0, T0-2N2-3M0, T3-4N0-3M0; Or LABC with NAC	Not mentioned	Study group: SIB of 32Gy/5Fx or sequential 12Gy/ 4Fx; Control group: SIB of 48Gy/15Fx, or sequential 12Gy/4Fx	For patients with N2-3	26Gy/5Fx/1w for WBI/Chest wall, and RNI in N+ or after NAC	40Gy/15Fx/3w for WBI/Chest wall, and RNI in N+ or after NAC	100	Acute and chronic grade 2 toxicity or higher	Unknown
NCT05665920	Brazil	≥18	2022	Yes	BCS; pT1-3 and pN1-3a; with indication of RNI	N/A	Not mentioned	No	26Gy/5Fx/1w	40Gy/15Fx/3w	36	Locoregional recurrence	Recruiting

Abbreviations: WBI = Whole Breast Irradiation; RNI = Regional Nodal Irradiation; IMNI = Internal Mammary Nodal Irradiation; N/A = Not Applicable; SIB = Simultaneous Integrated Boost; w = week; d = days; BCS = Breast-Conserving Surgery; LVSI = Lymphovascular Space Invasion; PBI = Partial Breast Irradiation; NAC = Neoadjuvant Chemotherapy; LABC = Locally Advanced Breast Cancer.