

Non-invasive mechanical ventilation in prone position

For use in the treatment of breast cancer

Vincent Vakaet, MD, PhD



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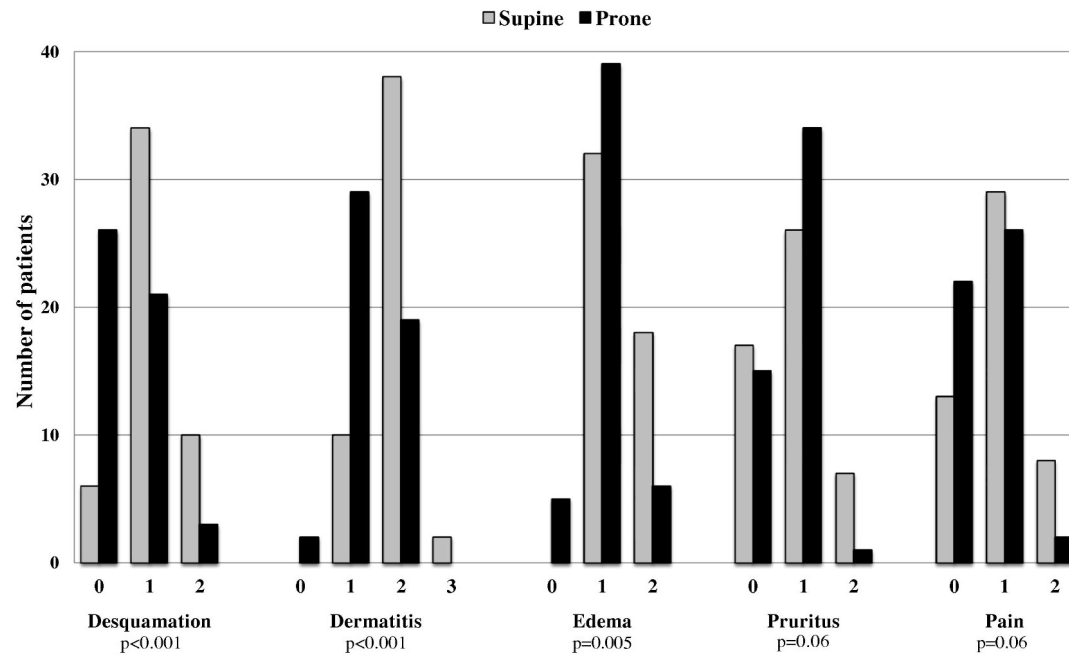
In Ghent were superfan of prone position



Why prone ?

Prone position reduces acute side effects

Ghent experience



Canadian experience

INTERVENTION

378 Patients randomized



189 Supine position

Adjuvant breast radiation in the supine position



189 Prone position

Adjuvant breast radiation in the prone position

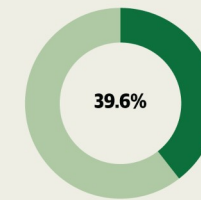
PRIMARY OUTCOME

Moist desquamation (grade 1, none; grade 2, patchy moist desquamation mostly confined to skin folds and creases; grade 3, moist desquamation in areas other than skin folds and creases)

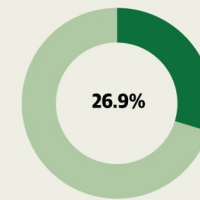
FINDINGS

There was statistically significantly more moist desquamation occurring anywhere, as well as grade 3 desquamation, in patients treated in the supine position compared with prone position

Desquamation anywhere in supine position group



Desquamation anywhere in prone position group



Desquamation anywhere:

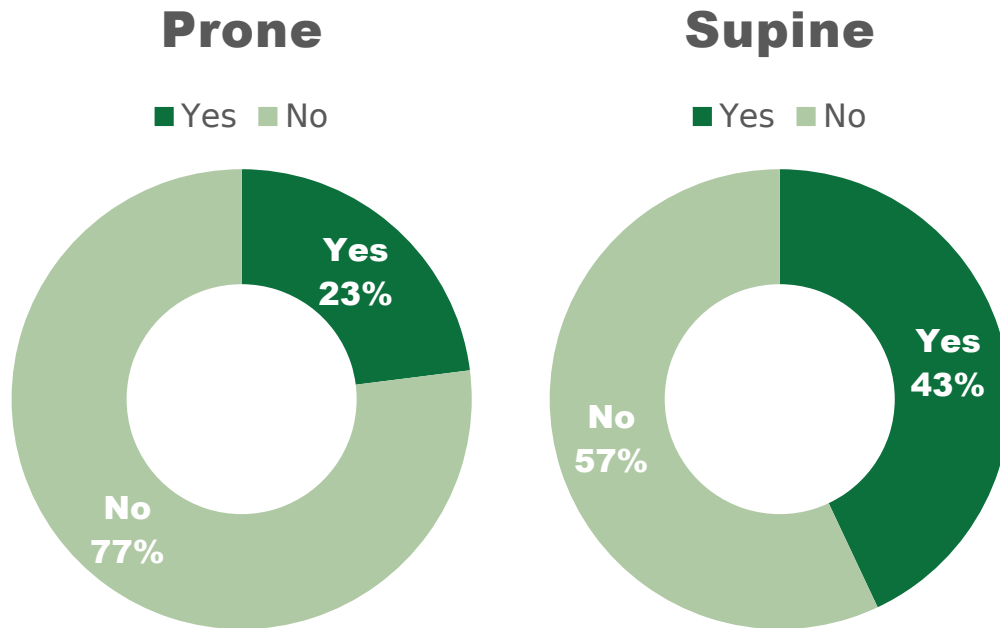
Supine vs prone: 39.6% vs 26.9% (odds ratio, 1.78; 95% CI, 1.24-2.56; $P = .002$)

Grade 3 desquamation:

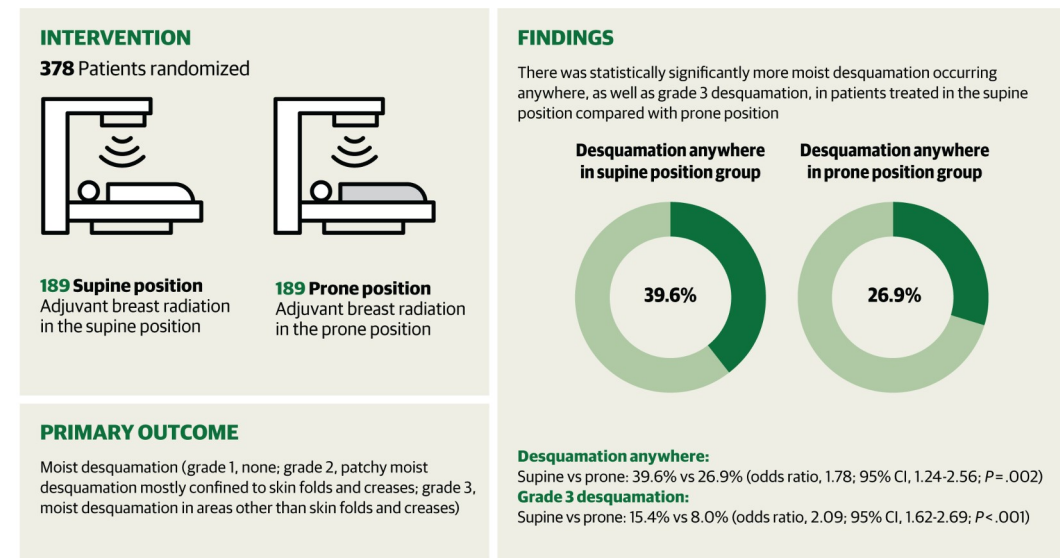
Supine vs prone: 15.4% vs 8.0% (odds ratio, 2.09; 95% CI, 1.62-2.69; $P < .001$)

Prone position reduces acute side effects

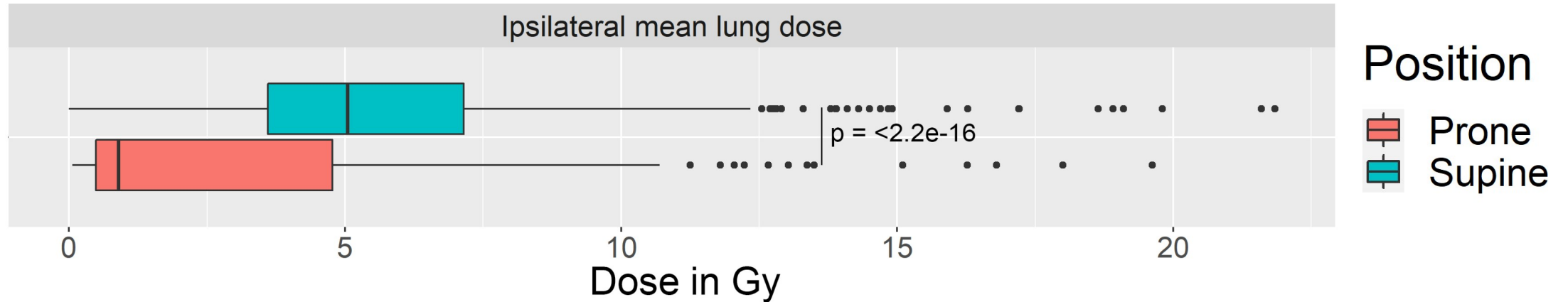
Ghent experience



Canadian experience



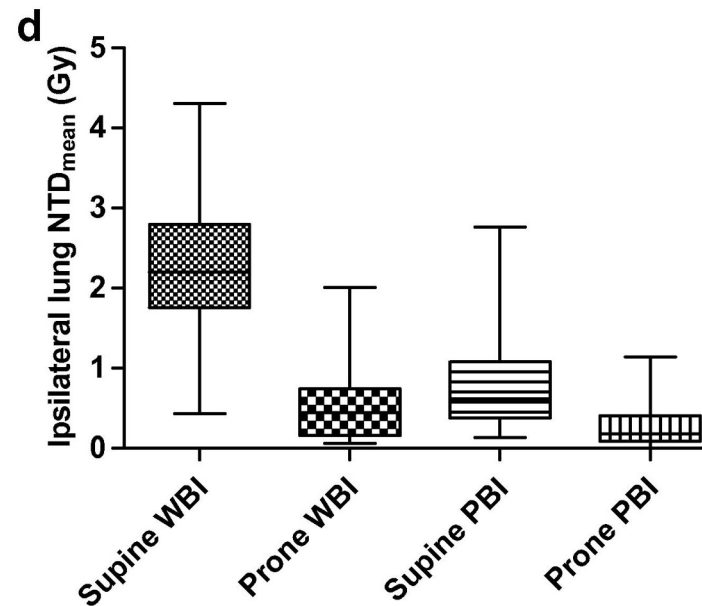
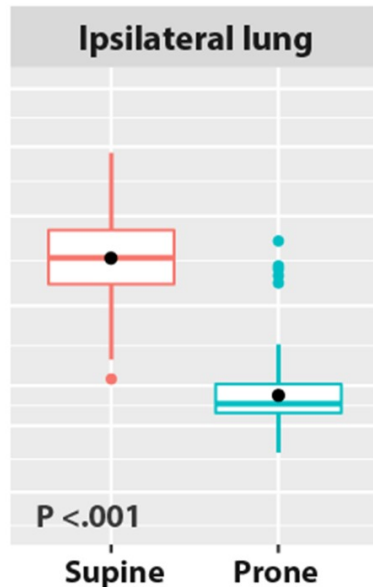
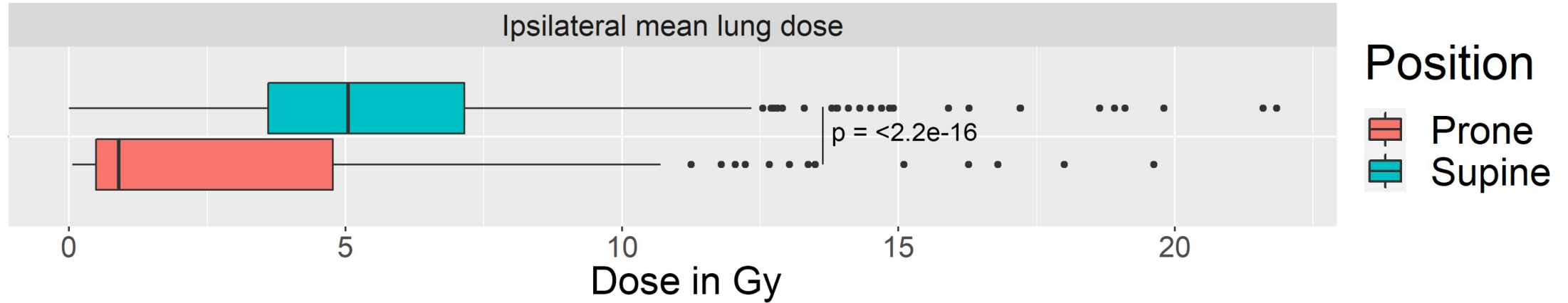
Mean lung dose is significantly lower



2.77 Gy vs 5.89 Gy, $p < .001$

More than 50% reduction

Mean lung dose is significantly lower



1. Vakaet V, Deseyne P, Bultijnck R, et al. Comparison of prone and supine positioning for breast cancer radiotherapy using REQUITE data: dosimetry, acute and two years physician and patient-reported outcomes. *Acta Oncol.* 2023;62(9):1036-1044.
2. Wang X, Fargier-Bochaton O, Dipasquale G, et al. Is prone free breathing better than supine deep inspiration breath-hold for left whole-breast radiotherapy? A dosimetric analysis. *Strahlenther Onkol.* 2021;197(4):317-331.
3. Kirby AM, Evans PM, Donovan EM, Convery HM, Haviland JS, Yarnold JR. Prone versus supine positioning for whole and partial-breast radiotherapy: a comparison of non-target tissue dosimetry. *Radiother Oncol.* 2010;96(2):178-184.

Mean lung dose is significantly lower

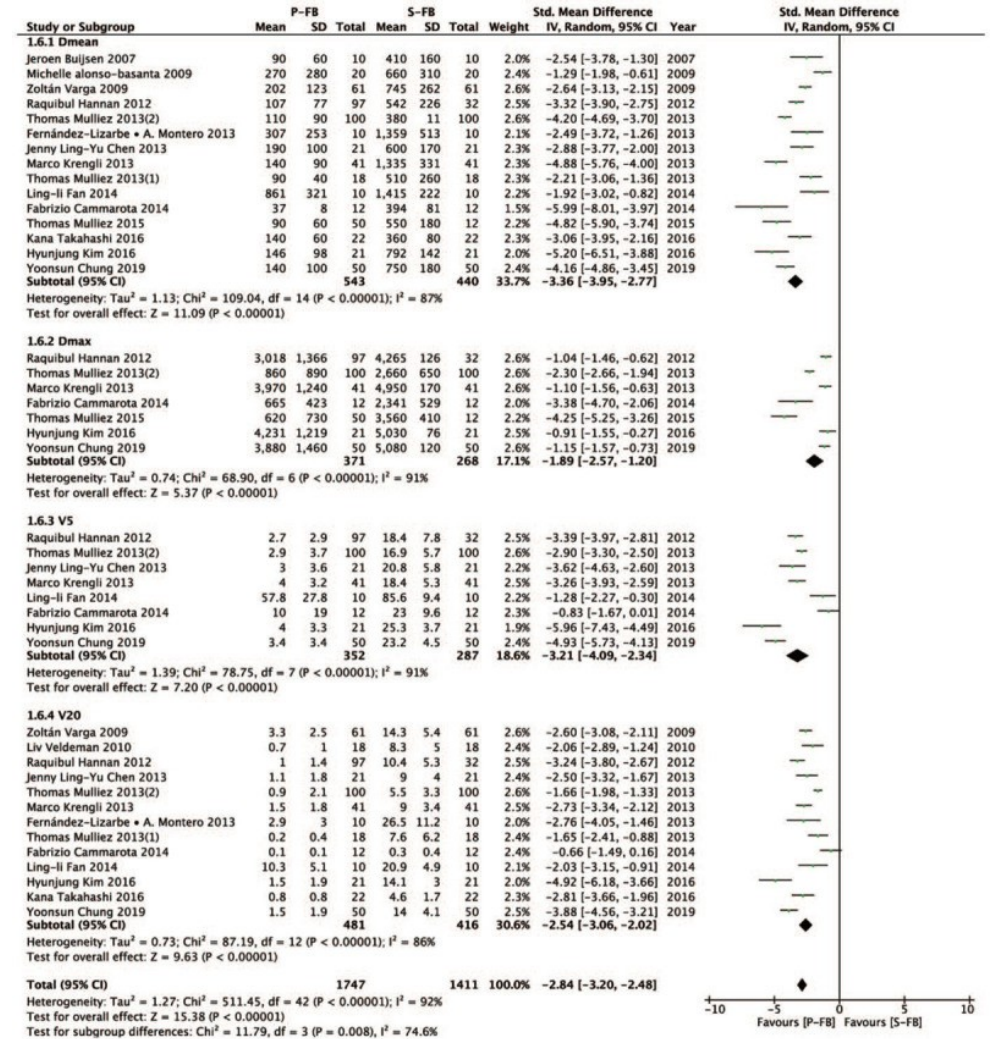
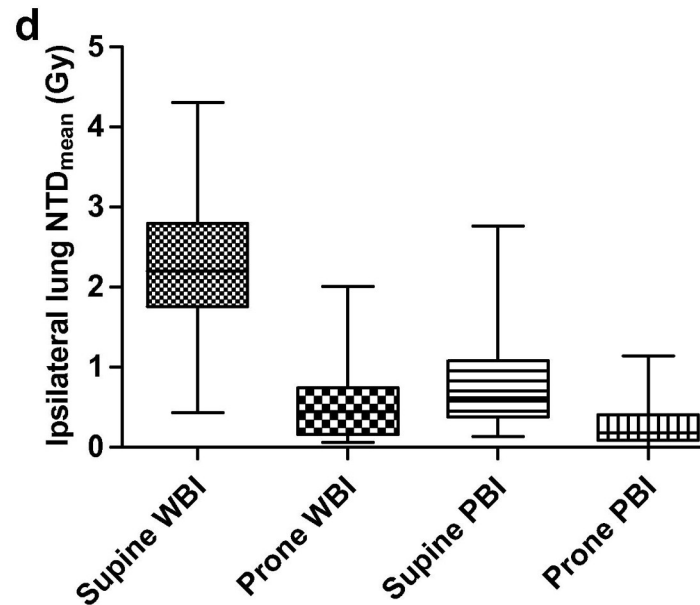
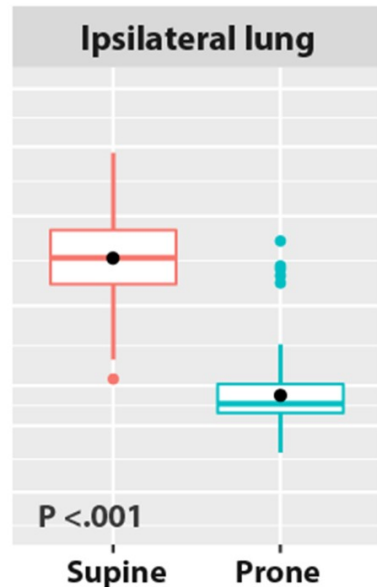
Systematic Review and Meta-Analysis

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Prone position versus supine position in postoperative radiotherapy for breast cancer A meta-analysis

Junming Lai, MM^{a,*}, Fangyan Zhong, MM^b, Jianxiong Deng, MM^b, Shuang Hu, BM^c, Ruoyan Shen, BM^d, Hui Luo, MD^b, Yongbiao Luo, BM^a



Mean heart dose is significantly lower

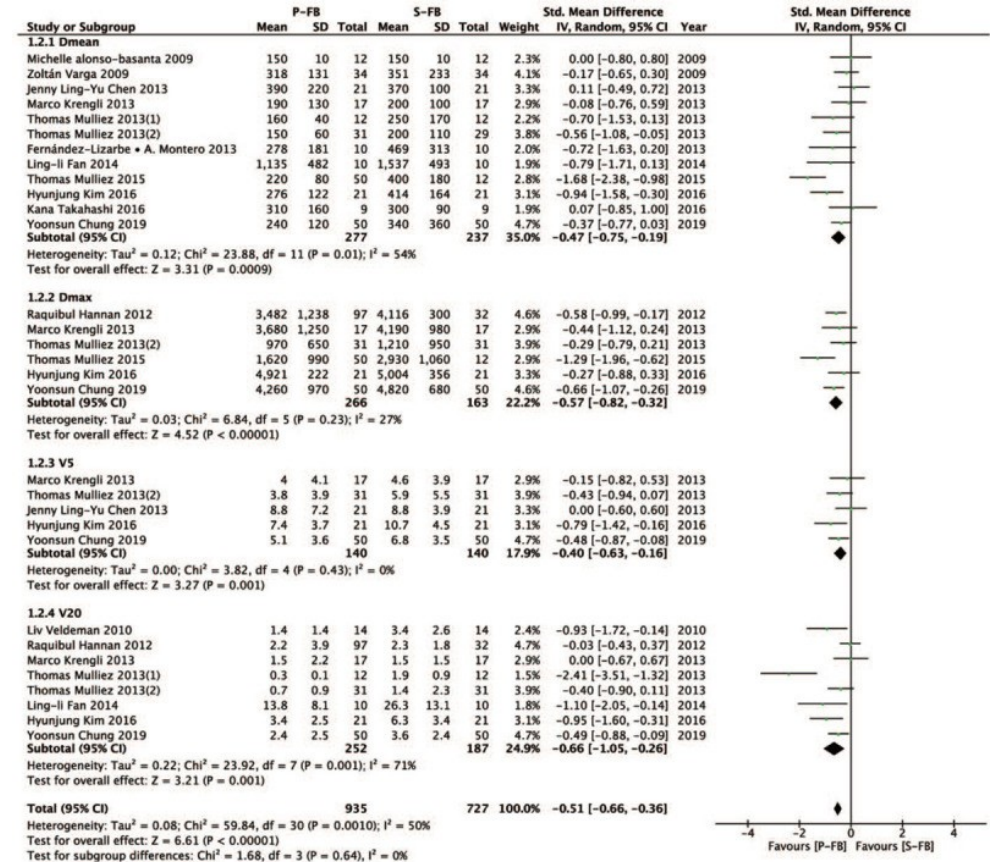
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Why not ?

Mean heart dose is higher compared to DIBH

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Table 2

The OAR dose of P-FB vs. S-DIBH.

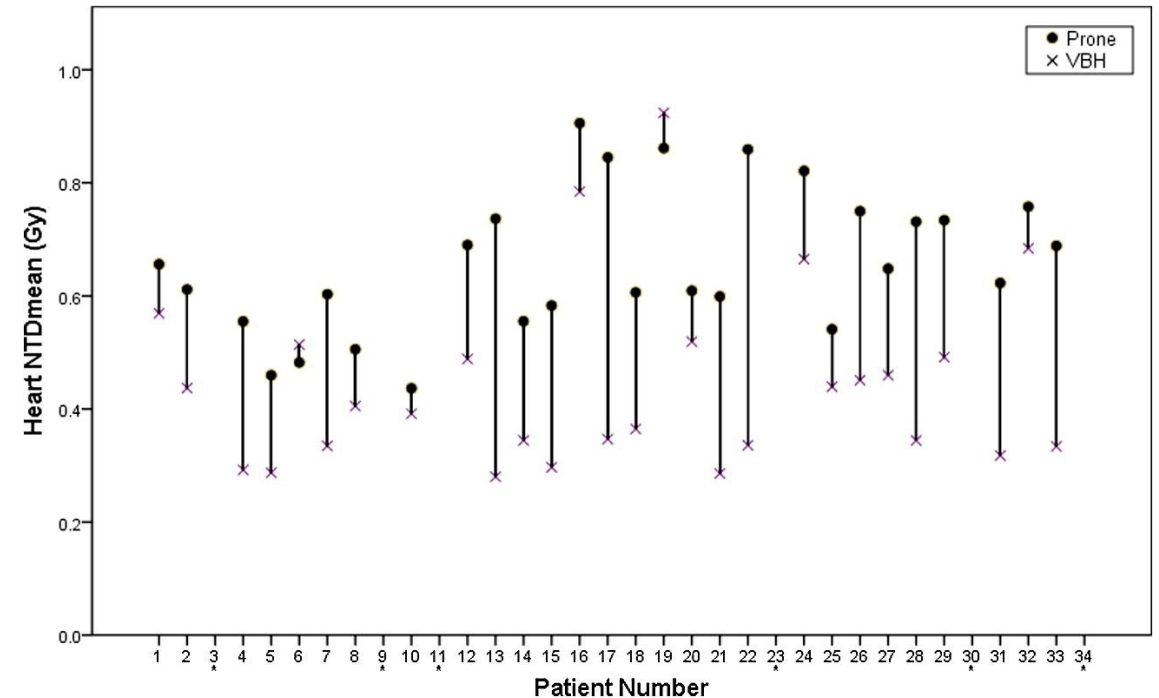
OAR	Studies	P-FB			S-DIBH			P value
		D _{mean}	SD/Min-Max	N	D _{mean}	SD/Min-Max	N	
Heart	Mulliez T 2015 ^[33]	250	110	50	220	120	12	<.001
	Saini A S 2018 ^[37]	98	83–115	33	108	120–220	33	.114
LADCA	Mulliez T 2015 ^[33]	830	530	50	1090	780	12	<.001
	Saini A S 2018 ^[37]	657	399–949	33	630	259–798	33	.122
ILL	Mulliez T 2015 ^[33]	90	69	50	500	180	12	<.001
	Saini A S 2018 ^[37]	61	47-80	33	554	429–642	33	<.001

DIBH = Deep inspiration breath hold, FB = Free breathing, ILL = Ipsilateral lung, Max = The maximum value, Min = The minimum value, N = Total number of patients, OAR = Organs at risk, P = Prone, S = Supine. The unit of all D_{mean} data is 'cGy'.

Heartspare compared prone and DIBH



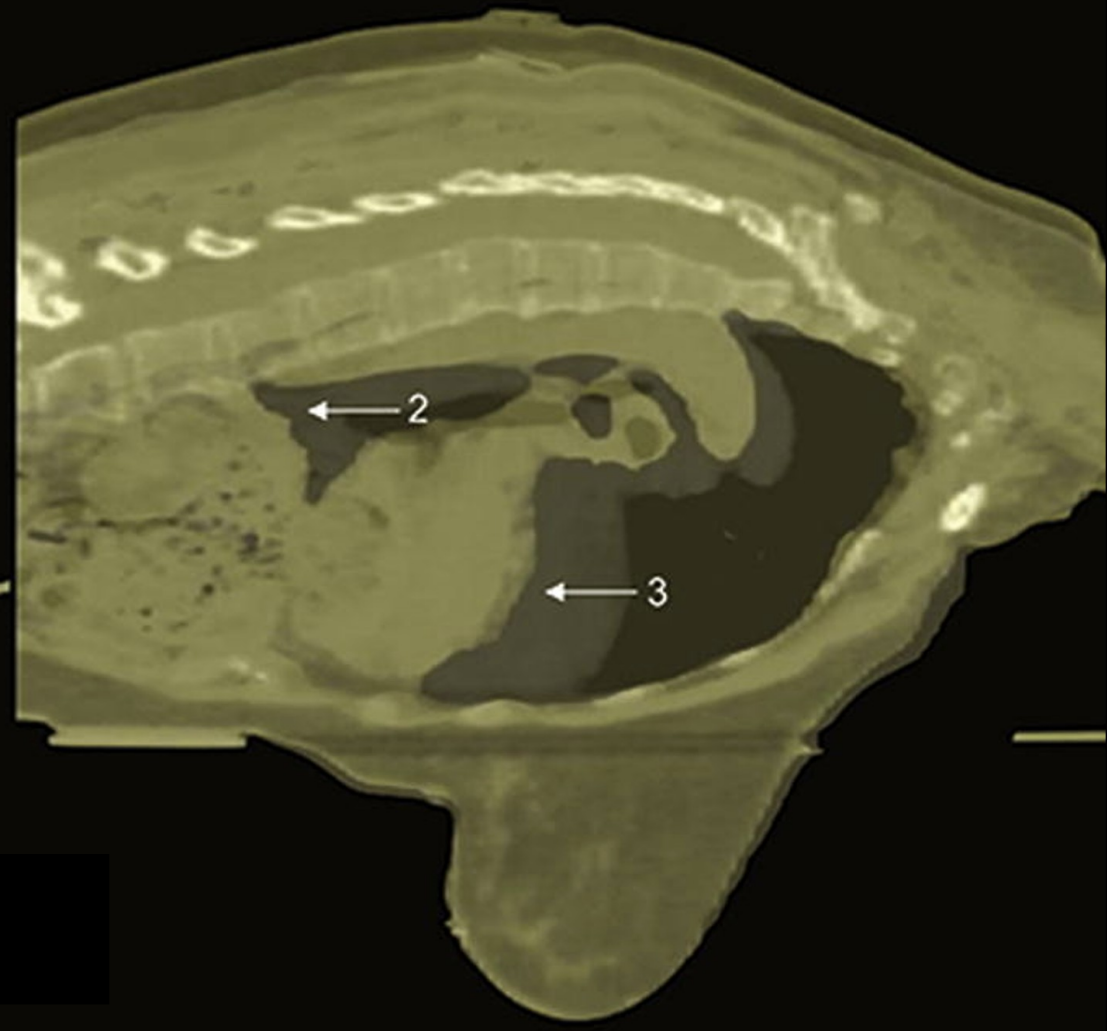
- Mean heart dose was lower in supine DIBH
 - 0.4 and 0.7 ($p < 0.001$)
- Patients found DIBH more comfortable than prone treatment
- Treatment setup and total treatment session times were significantly less with VBH ($p = 0.01$, $p = 0.002$ respectively)

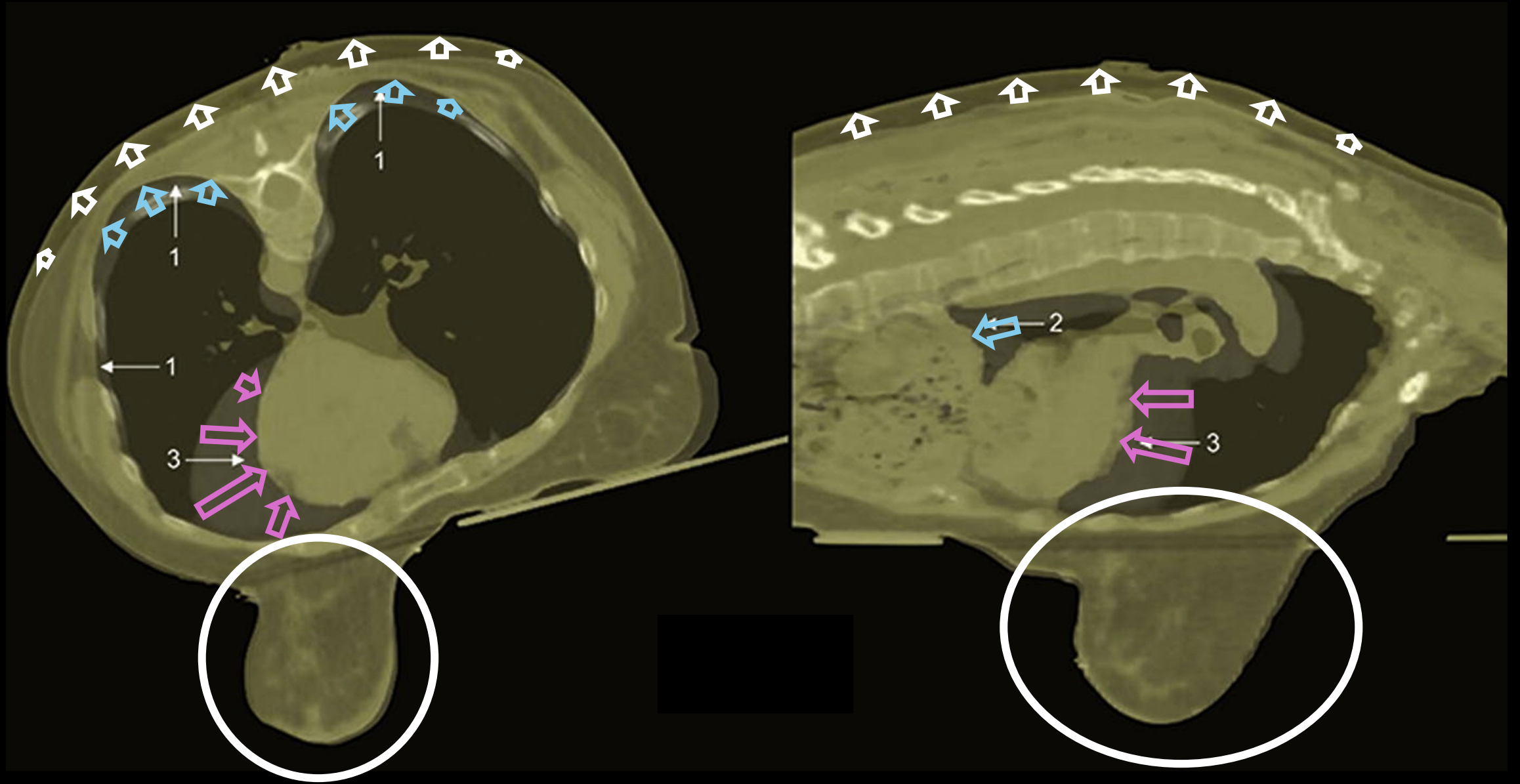


Bartlett FR, Colgan RM, Donovan EM, et al. The UK HeartSpare Study (Stage IB): randomised comparison of a voluntary breath-hold technique and prone radiotherapy after breast conserving surgery. *Radiother Oncol.* 2015;114(1):66-72.

Can we combine prone
and DIBH

Yes





DIBH is as easy in prone as in supine

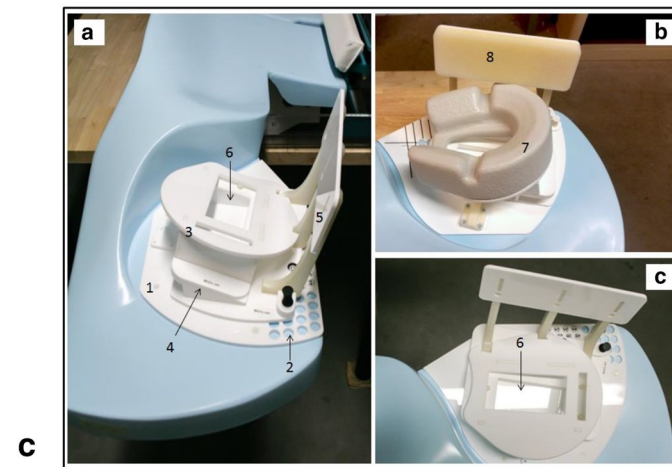
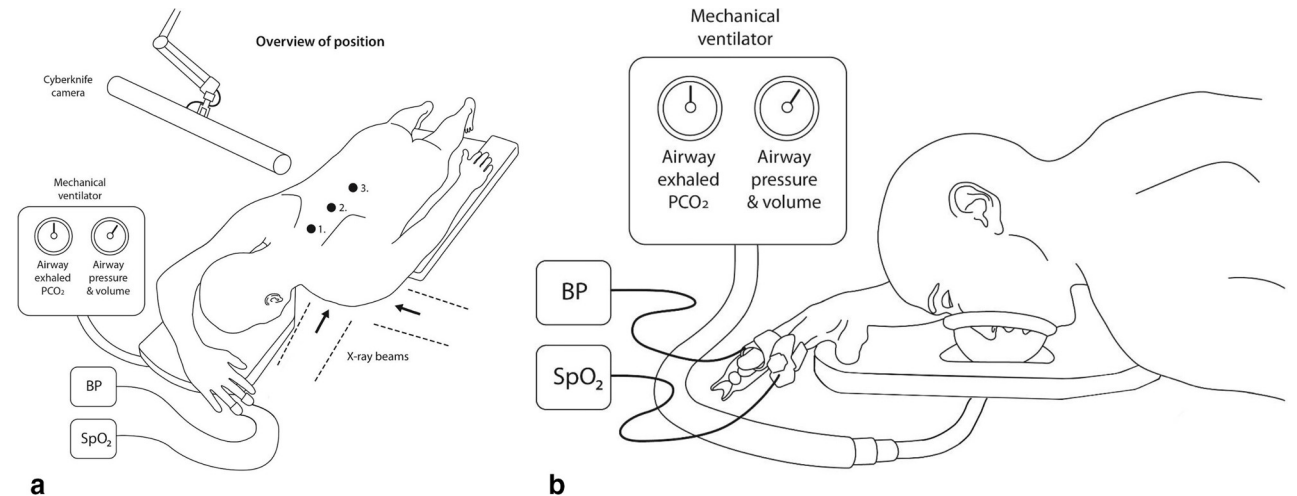
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Parkes M.J, De Neve W, Vakaet V, Heyes G, Jackson T, Delaney R, et al. Safely achieving single prolonged breath-holds of > 5 minutes for radiotherapy in the prone, front crawl position. *Br J Radiol* 2021; **94**: 20210079.

FULL PAPER

Safely achieving single prolonged breath-holds of > 5 minutes for radiotherapy in the prone, front crawl position

^{1,2,3,4}MJ PARKES, DPhil, ⁵WILFRIED DE NEVE, MD, PhD, ⁵VINCENT VAKAET, MD, ³GEOFFREY HEYES, PhD, ³TIMOTHY JACKSON, MSc, ³RICHARD DELANEY, MSc, ³GAVIN KIRBY, PhD, ³STUART GREEN, PhD, ⁶WARREN KILBY, MSc, ³JASON CASHMORE, PhD, ³QAMAR GHAFOR, MRCP, FRCA and ^{2,7}THOMAS CLUTTON-BROCK, MRCP, FRCA

- 19 healthy volunteers achieved supine, single prolonged breath-holds for mean of 6.2 ± 0.3 min. All were able to hold safely for the same duration while prone (6.1 ± 0.2 min ns. by paired ANOVA)
- Rate of chest deflation was the same as found previously during supine prolonged breath-holds



The optimal position for
breast radiotherapy

Prone DIBH spares the heart and the lung

Mean heart dose ranking

1. Prone DIBH
2. Supine DIBH
3. Prone FB
4. Supine FB

Ipsilateral mean lung dose ranking

1. Prone DIBH
2. Prone SB
3. Supine DIBH
4. Supine SB

Prone DIBH spares the heart and the lung

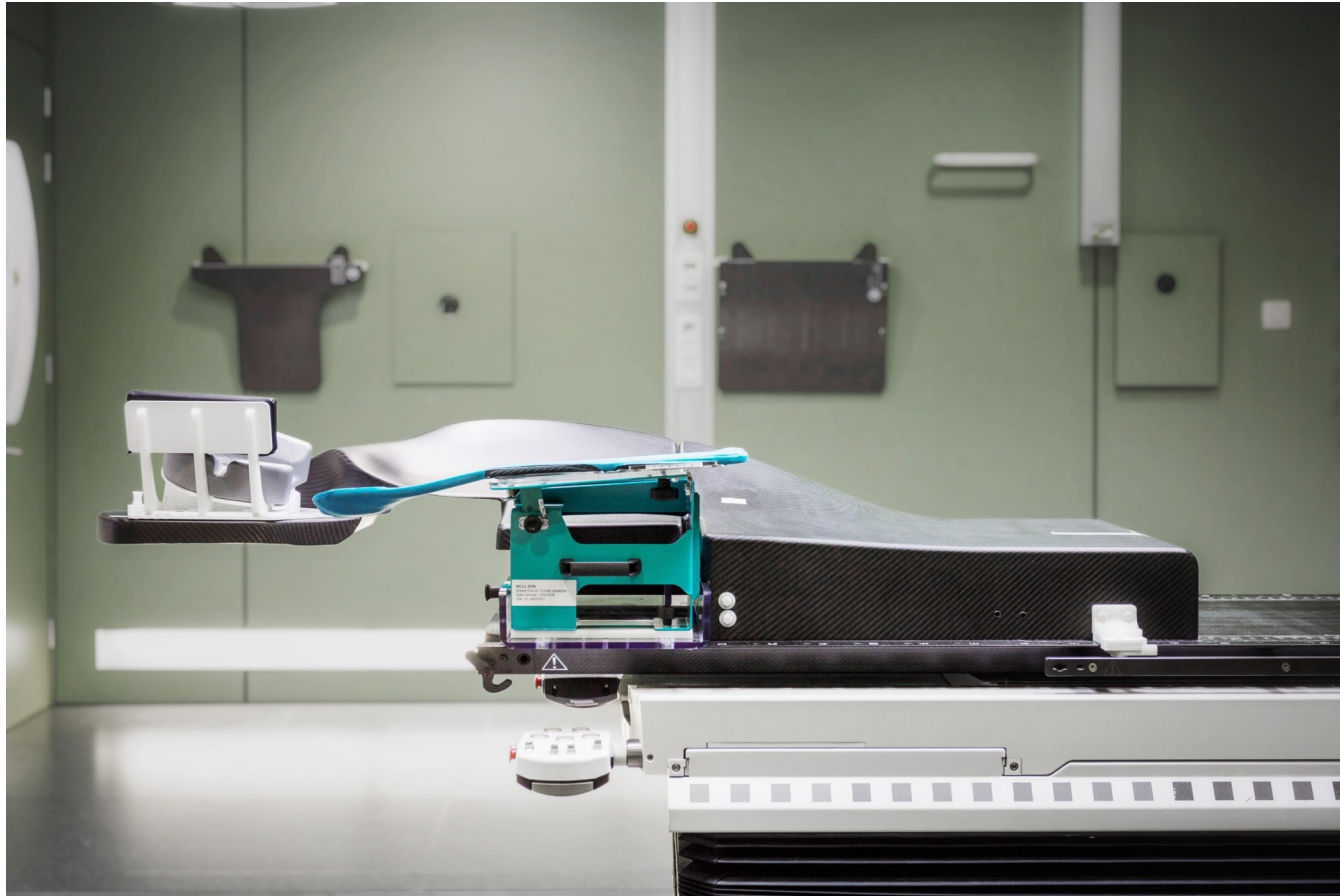
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Ipsilateral mean lung dose ranking

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2. Prone SB
3. Supine DIBH
4. Supine SB

New prone device greatly increase comfort



Henry van
de Velde
Awards



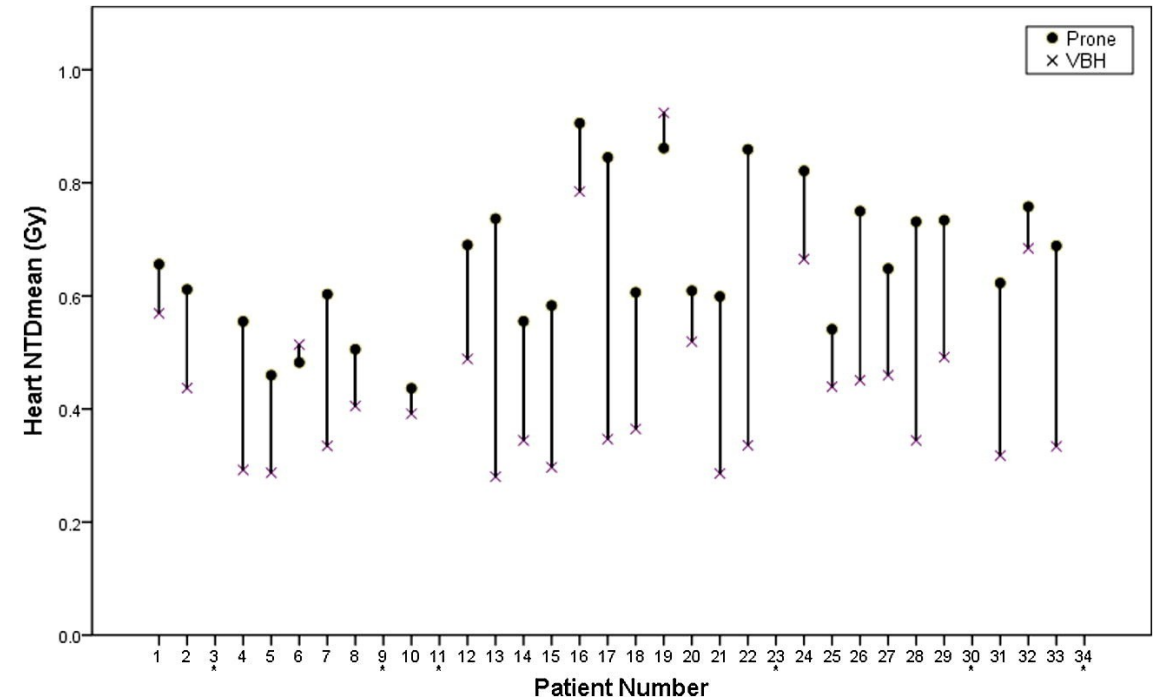
Henry van
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Awards



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