Consider the Precision and Power of Proton Therapy
for Lower Treatment Toxicities

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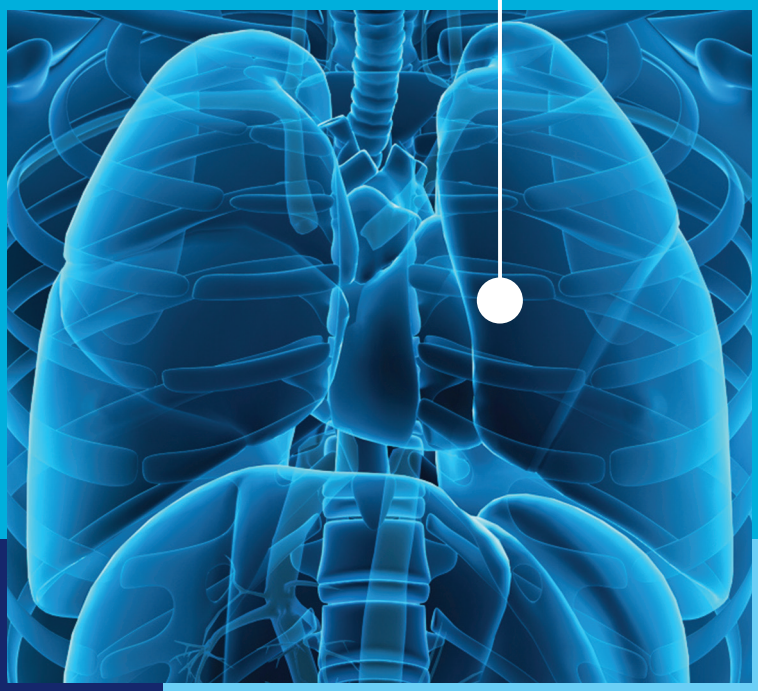
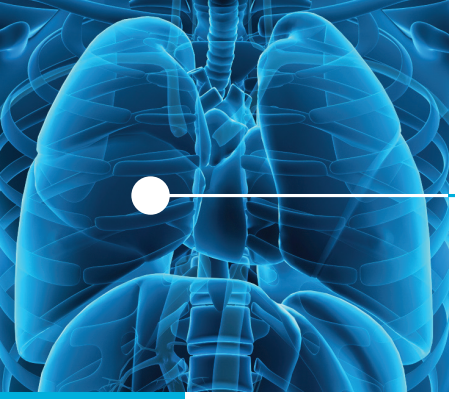


Proton therapy has proven efficacy in stage III non-small cell lung cancer

Recent studies indicate proton therapy has comparable survival rates with lower rates of pneumonitis and esophagitis in stage III non-small cell lung cancer (NSCLC) when compared to standard therapies such as conventional three-dimensional conformal radiotherapy (3D-CRT), and intensity-modulated radiotherapy (IMRT). Concomitant chemotherapy was given with protons, 3D-CRT, and IMRT.[1,2]

Maximize treatment dose while minimizing concerning side effects

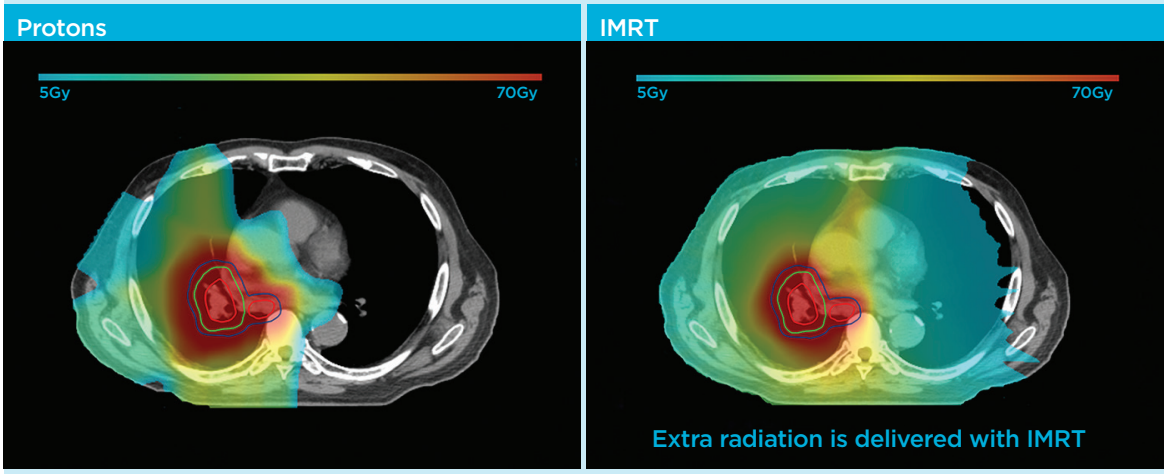
References: 1. Chang JY, Komaki R, Lu C, et al. Phase 2 study of high-dose proton therapy with concurrent chemotherapy for unresectable stage III nonsmall cell lung cancer. *Cancer*. 2011;117:4707-4713. **2.** Sejpal S, Komaki R, Tsao A, et al. Early findings on toxicity of proton beam therapy with concurrent chemotherapy for nonsmall cell lung cancer. *Cancer*. 2011;117:3004-3013.



Precision targeting to spare healthy tissue...

Proton therapy targets the lung tumor with more conformal specificity than other forms of radiotherapy, reducing excess radiation to the surrounding healthy tissue and organs[1]

A comparison of radiation treatment plans for NSCLC



Compared to intensity-modulated radiation therapy (IMRT), proton therapy reduced the dose of radiation to surrounding tissue, especially the heart, esophagus, and spinal cord.[1]

Proton therapy can even be given at an escalated dose with similar low rates of collateral radiation when compared to 3D-CRT and IMRT[1]

- Significantly lower mean total lung dose, volume-received doses (V) of V5, V10, and V20 were seen in stage III patients treated with proton therapy at 63 CGE and 74 CGE when compared to both 3D-CRT and IMRT at 63 Gy (P=.002 for both)[1]

References: 1. Chang JY, Zhang X, Wang X, et al. Significant reduction of normal tissue dose by proton radiotherapy compared with three-dimensional conformal or intensity-modulated radiation therapy in stage I or stage III non–small-cell lung cancer. *Int J Radiat Oncol Biol Phys.* 2006;65(4):1087-1096.

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Maximize treatment dose while minimizing concerning side effects

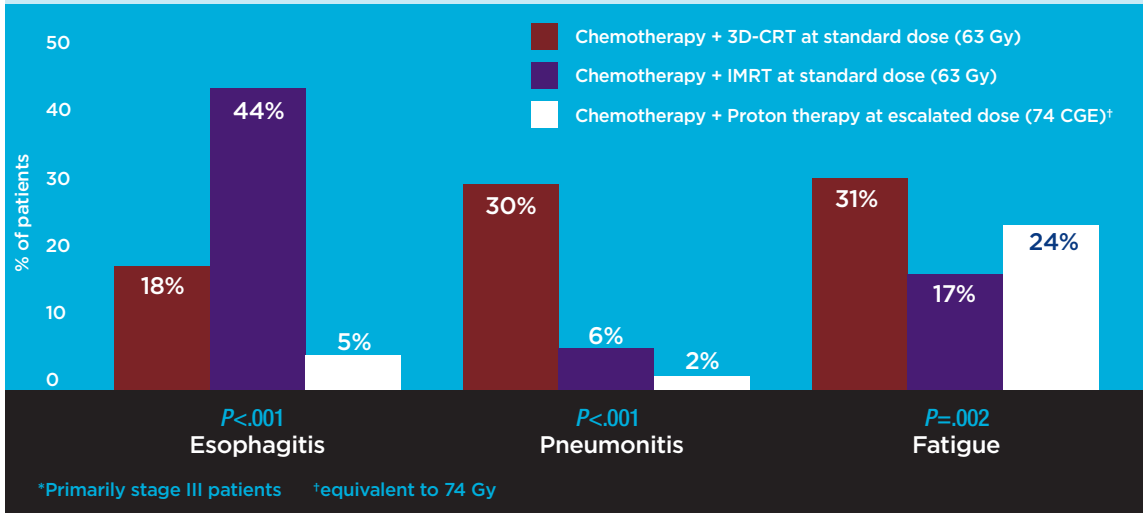
...and reduce toxicity

Treatment toxicity is correlated to mean total lung dose and volume-received doses for specific organs[1]

- Lung toxicity is correlated with the normal lung mean total dose, volume-received doses of 20 Gy (V20), but also 10 Gy (V10) and 5 Gy (V5)[1,2]
- Esophagus toxicity is correlated with volume-received dose of 55 Gy (V55)[1]

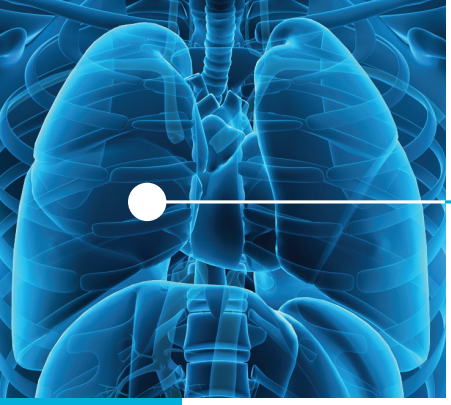
With significantly lower V5, V10, and V20 than standard radiotherapy options, proton therapy has corresponding lower rates of lung and esophageal toxicity[1,3]

Acute nonhematologic toxicity ≥ grade 3 occurring in ≥30% of patients with NSCLC after photon or proton therapy[3]*



Note that patients treated with proton therapy had lower rates of pneumonitis and esophagitis than patients treated with standard radiotherapies, even though they received a higher dose of radiation (74 CGE vs 63 Gy).[3]

References: 1. Chang JY, Zhang X, Wang X, et al. Significant reduction of normal tissue dose by proton radiotherapy compared with three-dimensional conformal or intensity-modulated radiation therapy in stage I or stage III non–small-cell lung cancer. *Int J Radiat Oncol Biol Phys.* 2006;65(4):1087-1096. **2.** Chang JY, Zhang X, Cox J. Comparison of conformity index in 3D-CRT, IMRT, and proton therapy in lung cancer: in reply to Dr. Armstrong. *Int J Radiat Oncol Biol Phys.* 2007;68(4):1272. **3.** Sejpal S, Komaki R, Tsao A, et al. Early findings on toxicity of proton beam therapy with concurrent chemotherapy for nonsmall cell lung cancer. *Cancer.* 2011;117:3004-3013.



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Maximize treatment dose while minimizing concerning side effects

Proton therapy provides the precision to target the tumor, and avoid the surrounding tissue

Proton therapy offers

- Similar efficacy to other forms of radiation[1,2]
- Lower excess radiation to surrounding healthy tissue and lung[3]
- Less volume-received doses at higher amounts of radiation[3]
- Significantly lower rates of pneumonitis and esophagitis compared to 3D-CRT and IMRT[2]

REMEMBER

Patients who are good candidates for proton therapy may have any of the following:

- Solid, localized tumor
- Proximity to critical structures or vital organs
- Intolerance to standard photon therapy
- Intolerance to concurrent chemotherapy
- Recurrent disease
- Risk for secondary malignancies

References: 1. Chang JY, Komaki R, Lu C, et al. Phase 2 study of high-dose proton therapy with concurrent chemotherapy for unresectable stage III nonsmall cell lung cancer. *Cancer*. 2011;117:4707-4713. **2.** Sejpal S, Komaki R, Tsao A, et al. Early findings on toxicity of proton beam therapy with concurrent chemotherapy for nonsmall cell lung cancer. *Cancer*. 2011;117:3004-3013. **3.** Chang JY, Zhang X, Wang X, et al. Significant reduction of normal tissue dose by proton radiotherapy compared with three-dimensional conformal or intensity-modulated radiation therapy in stage I or stage III non–small-cell lung cancer. *Int J Radiat Oncol Biol Phys*. 2006;65(4):1087-1096.

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