

00:00:00.160 --> 00:00:01.920 Funding for Yale Cancer Answers  
NOTE Confidence: 0.9443829

00:00:01.920 --> 00:00:03.679 is provided by Smilow Cancer  
NOTE Confidence: 0.9443829

00:00:03.679 --> 00:00:04.180 Hospital.  
NOTE Confidence: 0.9631407

00:00:06.160 --> 00:00:08.080 Welcome to Yale Cancer Answers  
NOTE Confidence: 0.9631407

00:00:08.080 --> 00:00:09.119 with the director of the  
NOTE Confidence: 0.9631407

00:00:09.119 --> 00:00:10.800 Yale Cancer Center, doctor Eric  
NOTE Confidence: 0.9631407

00:00:10.800 --> 00:00:11.300 Winer.  
NOTE Confidence: 0.9832591

00:00:11.840 --> 00:00:14.019 Yale Cancer Answers features conversations  
NOTE Confidence: 0.9832591

00:00:14.240 --> 00:00:15.965 with oncologists and specialists  
NOTE Confidence: 0.9832591

00:00:15.965 --> 00:00:17.005 who are on the forefront  
NOTE Confidence: 0.9832591

00:00:17.005 --> 00:00:17.965 of the battle to fight  
NOTE Confidence: 0.9832591

00:00:17.965 --> 00:00:18.465 cancer.  
NOTE Confidence: 0.9665273

00:00:19.085 --> 00:00:20.305 This week, it's a conversation  
NOTE Confidence: 0.9665273

00:00:20.445 --> 00:00:22.605 about radiation oncology with doctor  
NOTE Confidence: 0.9665273

00:00:22.605 --> 00:00:23.425 Peter Glazer.  
NOTE Confidence: 0.95460856

00:00:23.885 --> 00:00:25.244 Doctor Glazer is the Robert

NOTE Confidence: 0.95460856  
00:00:25.244 --> 00:00:26.945 E. Hunter Professor of Therapeutic  
NOTE Confidence: 0.95460856  
00:00:27.165 --> 00:00:27.665 Radiology  
NOTE Confidence: 0.96996987  
00:00:28.205 --> 00:00:30.160 and Professor of Genetics and  
NOTE Confidence: 0.96996987  
00:00:30.160 --> 00:00:31.280 chair of the department of  
NOTE Confidence: 0.96996987  
00:00:31.280 --> 00:00:33.120 therapeutic radiology at the Yale  
NOTE Confidence: 0.96996987  
00:00:33.120 --> 00:00:34.020 School of Medicine.  
NOTE Confidence: 0.8627474  
00:00:34.560 --> 00:00:35.700 Here's doctor Winer.  
NOTE Confidence: 0.96742463  
00:00:36.720 --> 00:00:38.400 Can you just tell us  
NOTE Confidence: 0.96742463  
00:00:38.400 --> 00:00:40.020 a little bit about yourself?  
NOTE Confidence: 0.96742463  
00:00:40.159 --> 00:00:41.680 How is it  
NOTE Confidence: 0.96742463  
00:00:41.680 --> 00:00:43.140 that you came to be  
NOTE Confidence: 0.96742463  
00:00:43.200 --> 00:00:44.500 a radiation oncologist?  
NOTE Confidence: 0.92239887  
00:00:45.425 --> 00:00:46.545 I'm a  
NOTE Confidence: 0.92239887  
00:00:46.545 --> 00:00:48.704 physician scientist with an MD  
NOTE Confidence: 0.92239887  
00:00:48.704 --> 00:00:50.165 and a PhD in genetics,  
NOTE Confidence: 0.91968155

00:00:50.625 --> 00:00:51.604 and as you mentioned,  
NOTE Confidence: 0.90205747

00:00:51.985 --> 00:00:53.425 my medical specialty is in  
NOTE Confidence: 0.90205747

00:00:53.425 --> 00:00:54.485 radiation oncology.  
00:00:56.145 --> 00:00:58.245 And my research focuses on fundamental  
NOTE Confidence: 0.9828321

00:00:58.305 --> 00:00:59.765 cancer biology and  
NOTE Confidence: 0.9238002

00:01:00.580 --> 00:01:01.960 development of translational  
NOTE Confidence: 0.9945344

00:01:02.260 --> 00:01:03.240 research opportunities.  
00:01:05.459 --> 00:01:06.580 I got started in the  
NOTE Confidence: 0.9872965

00:01:06.580 --> 00:01:08.100 field because of a strong  
NOTE Confidence: 0.9872965

00:01:08.100 --> 00:01:09.640 clinical interest in oncology,  
NOTE Confidence: 0.9546375

00:01:10.660 --> 00:01:11.620 and in taking care of  
NOTE Confidence: 0.9546375

00:01:11.620 --> 00:01:13.140 cancer patients, and that was  
NOTE Confidence: 0.9546375

00:01:13.140 --> 00:01:15.155 coupled with a growing research  
NOTE Confidence: 0.9546375

00:01:15.215 --> 00:01:16.655 interest in the field of  
NOTE Confidence: 0.9546375

00:01:16.655 --> 00:01:18.415 DNA repair, which is how  
NOTE Confidence: 0.9546375

00:01:18.415 --> 00:01:19.795 cells fix their DNA.  
NOTE Confidence: 0.9982176

00:01:20.655 --> 00:01:22.255 And that's an important topic

NOTE Confidence: 0.9982176  
00:01:22.255 --> 00:01:23.395 in the field of radiation  
NOTE Confidence: 0.9982176  
00:01:23.455 --> 00:01:23.955 oncology.  
NOTE Confidence: 0.99171865  
00:01:25.135 --> 00:01:26.550 Can you just  
NOTE Confidence: 0.9995375  
00:01:27.110 --> 00:01:28.569 tell us a little bit  
NOTE Confidence: 0.9995375  
00:01:28.630 --> 00:01:29.130 about  
NOTE Confidence: 0.9548489  
00:01:29.670 --> 00:01:31.290 radiation as a treatment,  
NOTE Confidence: 0.9984775  
00:01:32.870 --> 00:01:34.390 both in terms of how  
NOTE Confidence: 0.9984775  
00:01:34.390 --> 00:01:35.290 it's delivered, or  
00:01:36.790 --> 00:01:38.870 I should say the different  
NOTE Confidence: 0.955898  
00:01:38.870 --> 00:01:39.990 ways in which it can  
NOTE Confidence: 0.955898  
00:01:39.990 --> 00:01:40.650 be delivered.  
NOTE Confidence: 0.9922816  
00:01:41.685 --> 00:01:43.524 And then we'll explore  
NOTE Confidence: 0.9922816  
00:01:43.524 --> 00:01:45.145 some other aspects of radiation.  
NOTE Confidence: 0.98677063  
00:01:45.604 --> 00:01:47.125 Sure. Radiation  
NOTE Confidence: 0.98677063  
00:01:47.125 --> 00:01:49.384 oncology is the medical specialty  
NOTE Confidence: 0.9847176  
00:01:49.844 --> 00:01:51.444 that uses focused x rays

NOTE Confidence: 0.9847176  
00:01:51.444 --> 00:01:52.424 to treat cancer  
NOTE Confidence: 0.98173666  
00:01:52.804 --> 00:01:53.924 because of their ability to  
NOTE Confidence: 0.98173666  
00:01:53.924 --> 00:01:55.145 kill cancer cells.  
NOTE Confidence: 0.978166  
00:01:55.820 --> 00:01:57.580 And early medical applications of  
NOTE Confidence: 0.978166  
00:01:57.580 --> 00:01:59.440 radiation were based on radioactive  
NOTE Confidence: 0.978166  
00:01:59.740 --> 00:02:01.040 materials like radium  
NOTE Confidence: 0.96877635  
00:02:01.420 --> 00:02:02.800 that were discovered by  
NOTE Confidence: 0.9524626  
00:02:03.260 --> 00:02:05.260 Marie Curie, because early on  
NOTE Confidence: 0.9524626  
00:02:05.260 --> 00:02:06.300 it was found that radiation  
NOTE Confidence: 0.9524626  
00:02:06.300 --> 00:02:07.840 causes tumors to shrink.  
NOTE Confidence: 0.9160222  
00:02:08.715 --> 00:02:10.395 Later on, other isotopes like  
NOTE Confidence: 0.9160222  
00:02:10.395 --> 00:02:11.535 cobalt, iridium,  
NOTE Confidence: 0.9465155  
00:02:12.235 --> 00:02:14.235 and others were identified and  
NOTE Confidence: 0.9465155  
00:02:14.235 --> 00:02:14.735 developed,  
NOTE Confidence: 0.97021955  
00:02:15.115 --> 00:02:15.995 and some are used for  
NOTE Confidence: 0.97021955

00:02:15.995 --> 00:02:17.195 a type of treatment called  
NOTE Confidence: 0.97021955

00:02:17.195 --> 00:02:19.435 brachytherapy, which involves placement of  
NOTE Confidence: 0.97021955

00:02:19.435 --> 00:02:19.935 radioactive  
NOTE Confidence: 0.9963696

00:02:20.235 --> 00:02:20.735 sources  
NOTE Confidence: 0.97224194

00:02:21.659 --> 00:02:23.099 in close proximity to a  
NOTE Confidence: 0.97224194

00:02:23.099 --> 00:02:24.939 tumor as is frequently done  
NOTE Confidence: 0.97224194

00:02:24.939 --> 00:02:26.079 for cancers of  
00:02:27.739 --> 00:02:28.400 the gynecologic  
NOTE Confidence: 0.8802894

00:02:29.819 --> 00:02:30.959 tract in women.  
NOTE Confidence: 0.95679003

00:02:31.340 --> 00:02:33.180 So a device is actually  
NOTE Confidence: 0.95679003

00:02:33.180 --> 00:02:34.379 put in and it gives  
NOTE Confidence: 0.95679003

00:02:34.379 --> 00:02:35.120 off radiation  
NOTE Confidence: 0.9969416

00:02:35.419 --> 00:02:36.719 while it sits  
NOTE Confidence: 0.9623813

00:02:37.315 --> 00:02:39.475 essentially near or within somebody.  
NOTE Confidence: 0.9623813

00:02:39.475 --> 00:02:40.995 It dwells next to the tumor.  
NOTE Confidence: 0.9412079

00:02:44.755 --> 00:02:46.355 It's put in a  
NOTE Confidence: 0.9412079

00:02:46.355 --> 00:02:48.035 surgical procedure, and then it's  
NOTE Confidence: 0.9412079

00:02:48.035 --> 00:02:49.919 removed after a specified time.  
NOTE Confidence: 0.91906005

00:02:51.280 --> 00:02:52.639 And in some other  
NOTE Confidence: 0.91906005

00:02:52.639 --> 00:02:54.720 approaches, isotopes are  
NOTE Confidence: 0.91906005

00:02:54.720 --> 00:02:57.139 injected systemically for special applications  
NOTE Confidence: 0.93126523

00:02:57.840 --> 00:02:59.200 usually linked to a carrier  
NOTE Confidence: 0.93126523

00:02:59.200 --> 00:03:00.099 like an antibody.  
00:03:02.480 --> 00:03:03.840 When X rays were first  
NOTE Confidence: 0.9497798

00:03:03.840 --> 00:03:05.025 developed, it was known that  
NOTE Confidence: 0.9497798

00:03:05.025 --> 00:03:06.224 they could be generated by  
NOTE Confidence: 0.9497798

00:03:06.224 --> 00:03:07.665 cathode ray tubes, but  
NOTE Confidence: 0.9497798

00:03:07.665 --> 00:03:08.784 that was low energy and  
NOTE Confidence: 0.9497798

00:03:08.784 --> 00:03:10.864 had drawbacks. So after World  
NOTE Confidence: 0.9497798

00:03:10.864 --> 00:03:12.325 War II, a major advance  
NOTE Confidence: 0.9497798

00:03:12.385 --> 00:03:14.165 was the development of technology  
NOTE Confidence: 0.9497798

00:03:14.385 --> 00:03:14.885 to  
NOTE Confidence: 0.90001875

00:03:15.264 --> 00:03:16.484 accelerate electrons  
NOTE Confidence: 0.9869084

00:03:17.510 --> 00:03:18.870 at high voltage into a  
NOTE Confidence: 0.9869084

00:03:18.870 --> 00:03:20.250 medical target to  
NOTE Confidence: 0.9133087

00:03:20.630 --> 00:03:22.150 generate high energy x rays  
NOTE Confidence: 0.9133087

00:03:22.150 --> 00:03:22.889 or photons.  
NOTE Confidence: 0.8574264

00:03:23.270 --> 00:03:24.389 And that was the birth  
NOTE Confidence: 0.8574264

00:03:24.389 --> 00:03:26.389 of the linear accelerator or  
NOTE Confidence: 0.8574264

00:03:26.389 --> 00:03:26.889 LINAC.  
NOTE Confidence: 0.9344603

00:03:27.510 --> 00:03:29.270 And this allowed for treatment  
NOTE Confidence: 0.9344603

00:03:29.270 --> 00:03:30.470 of deep seated tumors in  
NOTE Confidence: 0.9344603

00:03:30.470 --> 00:03:31.995 the body with sparing of  
NOTE Confidence: 0.9344603

00:03:32.155 --> 00:03:32.655 superficial  
NOTE Confidence: 0.9975171

00:03:32.955 --> 00:03:33.455 tissues.  
00:03:35.034 --> 00:03:35.995 And it seems to me that  
NOTE Confidence: 0.99436325

00:03:35.995 --> 00:03:37.355 it was the case many  
NOTE Confidence: 0.99436325

00:03:37.355 --> 00:03:38.174 years ago  
NOTE Confidence: 0.8869544



00:03:38.715 --> 00:03:41.055 that radiation oncologists would take

NOTE Confidence: 0.8869544

00:03:41.114 --> 00:03:42.575 an x-ray,

NOTE Confidence: 0.9856625

00:03:42.955 --> 00:03:44.555 just a standard x-ray that

NOTE Confidence: 0.9856625

00:03:44.555 --> 00:03:46.075 might show, for example, in

NOTE Confidence: 0.9856625

00:03:46.075 --> 00:03:46.735 the chest

NOTE Confidence: 0.95888144

00:03:47.270 --> 00:03:48.170 a lung cancer.

NOTE Confidence: 0.9985215

00:03:48.870 --> 00:03:49.370 And

NOTE Confidence: 0.9949631

00:03:49.910 --> 00:03:51.750 in what now seems like

NOTE Confidence: 0.9949631

00:03:51.750 --> 00:03:53.690 a pretty crude manner,

NOTE Confidence: 0.9951218

00:03:54.069 --> 00:03:56.069 they would just draw around

NOTE Confidence: 0.9951218

00:03:56.069 --> 00:03:57.830 that tumor and then aim

NOTE Confidence: 0.9951218

00:03:57.830 --> 00:03:58.569 the beam

NOTE Confidence: 0.9978577

00:03:59.834 --> 00:04:01.375 at the tumor. Is that

NOTE Confidence: 0.99432415

00:04:02.075 --> 00:04:03.614 basically right?

NOTE Confidence: 0.8962092

00:04:03.995 --> 00:04:04.735 Yes, early on

NOTE Confidence: 0.9709413

00:04:05.355 --> 00:04:07.515 the treatment machines were

NOTE Confidence: 0.9709413  
00:04:07.515 --> 00:04:09.114 were limited in  
NOTE Confidence: 0.9943869  
00:04:09.754 --> 00:04:11.194 their ability to move and  
NOTE Confidence: 0.9943869  
00:04:11.194 --> 00:04:13.534 to deliver shaped beams. So  
NOTE Confidence: 0.9943869  
00:04:13.750 --> 00:04:15.030 most of the treatments were  
NOTE Confidence: 0.9943869  
00:04:15.030 --> 00:04:15.910 from the front or the  
NOTE Confidence: 0.9943869  
00:04:15.910 --> 00:04:17.110 back of the patient in  
NOTE Confidence: 0.9943869  
00:04:17.110 --> 00:04:17.770 a simple  
NOTE Confidence: 0.89462936  
00:04:18.150 --> 00:04:18.650 way.  
NOTE Confidence: 0.95531887  
00:04:19.669 --> 00:04:21.110 And so we were guided  
NOTE Confidence: 0.95531887  
00:04:21.110 --> 00:04:22.470 by what we kind of  
NOTE Confidence: 0.95531887  
00:04:22.470 --> 00:04:23.850 refer to as two dimensional  
NOTE Confidence: 0.95531887  
00:04:23.910 --> 00:04:25.430 imaging, which is those plain  
NOTE Confidence: 0.95531887  
00:04:25.430 --> 00:04:26.490 film x rays.  
NOTE Confidence: 0.96178615  
00:04:27.029 --> 00:04:28.150 But, one of  
NOTE Confidence: 0.96178615  
00:04:28.150 --> 00:04:29.130 the major advances  
NOTE Confidence: 0.97297657

00:04:30.015 --> 00:04:31.695 in field has  
NOTE Confidence: 0.97297657

00:04:31.695 --> 00:04:32.995 been the use of advanced  
NOTE Confidence: 0.97297657

00:04:33.055 --> 00:04:35.375 imaging like CT scans, MRI  
NOTE Confidence: 0.97297657

00:04:35.375 --> 00:04:36.654 scans, or now even PET  
NOTE Confidence: 0.97297657

00:04:36.654 --> 00:04:37.154 scanning  
NOTE Confidence: 0.94852924

00:04:37.535 --> 00:04:39.695 to create three-dimensional images  
NOTE Confidence: 0.94852924

00:04:39.695 --> 00:04:40.995 of the tumor target.  
NOTE Confidence: 0.9538291

00:04:41.375 --> 00:04:42.755 And that's coupled with  
NOTE Confidence: 0.9992017

00:04:43.440 --> 00:04:44.180 many technological  
NOTE Confidence: 0.9859065

00:04:44.720 --> 00:04:46.580 advances in the linear accelerators  
NOTE Confidence: 0.9859065

00:04:46.720 --> 00:04:47.380 that allow  
NOTE Confidence: 0.8635429

00:04:48.400 --> 00:04:50.260 the delivery of very complex,  
NOTE Confidence: 0.97732925

00:04:51.440 --> 00:04:53.040 beam arrangements that really shape  
NOTE Confidence: 0.97732925

00:04:53.040 --> 00:04:54.640 the dose distribution in a  
NOTE Confidence: 0.97732925

00:04:54.640 --> 00:04:55.860 three-dimensional manner.  
NOTE Confidence: 0.9817357

00:04:56.514 --> 00:04:58.115 And my sense is that

NOTE Confidence: 0.9817357  
00:04:58.115 --> 00:05:00.435 by using those three-dimensional images  
NOTE Confidence: 0.9817357  
00:05:00.435 --> 00:05:02.275 like CT scans and with  
NOTE Confidence: 0.9817357  
00:05:02.275 --> 00:05:04.194 the changes in some of  
NOTE Confidence: 0.9817357  
00:05:04.194 --> 00:05:04.694 your,  
NOTE Confidence: 0.9850942  
00:05:05.315 --> 00:05:07.014 equipment that delivers radiation,  
NOTE Confidence: 0.95083815  
00:05:07.714 --> 00:05:08.914 two things have happened.  
NOTE Confidence: 0.95083815  
00:05:08.914 --> 00:05:10.789 The treatment is far more  
NOTE Confidence: 0.95083815  
00:05:10.789 --> 00:05:11.289 effective,  
NOTE Confidence: 0.9915035  
00:05:11.990 --> 00:05:13.289 and at the same time,  
NOTE Confidence: 0.9915035  
00:05:13.349 --> 00:05:15.190 you can spare patients a  
NOTE Confidence: 0.9915035  
00:05:15.190 --> 00:05:16.389 lot of the side effects  
NOTE Confidence: 0.9915035  
00:05:16.389 --> 00:05:17.430 that used to be pretty  
NOTE Confidence: 0.9915035  
00:05:17.430 --> 00:05:17.930 commonplace.  
NOTE Confidence: 0.9845463  
00:05:18.710 --> 00:05:20.150 That's right. Because now we  
NOTE Confidence: 0.9845463  
00:05:20.150 --> 00:05:21.930 can shape the dose distribution  
NOTE Confidence: 0.98972744

00:05:22.310 --> 00:05:23.289 a lot more conformally  
NOTE Confidence: 0.999733

00:05:23.589 --> 00:05:24.889 to the tumor itself  
NOTE Confidence: 0.969301

00:05:25.515 --> 00:05:27.435 and substantially reduce the dose  
NOTE Confidence: 0.969301

00:05:27.435 --> 00:05:28.735 to surrounding tissues.  
00:05:30.075 --> 00:05:32.154 That's allowed us to deliver  
NOTE Confidence: 0.93062246

00:05:32.154 --> 00:05:32.815 the treatments  
NOTE Confidence: 0.961471

00:05:33.435 --> 00:05:35.275 much more safely with less  
NOTE Confidence: 0.961471

00:05:35.275 --> 00:05:36.015 side effects.  
NOTE Confidence: 0.98517853

00:05:36.714 --> 00:05:38.235 And in some cases, we  
NOTE Confidence: 0.98517853

00:05:38.235 --> 00:05:39.920 can give a higher dose  
NOTE Confidence: 0.98517853

00:05:39.920 --> 00:05:41.600 each day and reduce  
NOTE Confidence: 0.98517853

00:05:41.600 --> 00:05:42.580 the number of  
NOTE Confidence: 0.9677575

00:05:43.280 --> 00:05:45.040 days of treatment and that's  
NOTE Confidence: 0.9677575

00:05:45.040 --> 00:05:45.520 also a  
NOTE Confidence: 0.98016626

00:05:45.840 --> 00:05:47.840 benefit to patients.  
NOTE Confidence: 0.98016626

00:05:47.840 --> 00:05:49.360 Before we get into some  
NOTE Confidence: 0.98016626

00:05:49.360 --> 00:05:50.500 additional advances,  
NOTE Confidence: 0.9991252

00:05:50.985 --> 00:05:52.505 maybe you could just comment  
NOTE Confidence: 0.9991252

00:05:52.505 --> 00:05:54.665 on some of the myths  
NOTE Confidence: 0.9991252

00:05:54.665 --> 00:05:56.525 that people still carry around  
NOTE Confidence: 0.88518363

00:05:57.225 --> 00:05:58.125 about radiation.  
NOTE Confidence: 0.9724888

00:05:59.065 --> 00:06:00.044 You know, in  
NOTE Confidence: 0.98421955

00:06:00.665 --> 00:06:01.865 not such a different way  
NOTE Confidence: 0.98421955

00:06:01.865 --> 00:06:02.925 than with chemotherapy,  
NOTE Confidence: 0.9968039

00:06:03.225 --> 00:06:03.865 there are a lot of  
NOTE Confidence: 0.9968039

00:06:03.865 --> 00:06:05.310 patients who come see us  
NOTE Confidence: 0.9991517

00:06:05.790 --> 00:06:08.210 and have preconceived notions about  
NOTE Confidence: 0.96337736

00:06:08.830 --> 00:06:10.190 what these treatments are like  
NOTE Confidence: 0.96337736

00:06:10.190 --> 00:06:11.310 and will come in saying,  
NOTE Confidence: 0.96337736

00:06:11.310 --> 00:06:12.510 well, I'm never doing that  
NOTE Confidence: 0.96337736

00:06:12.510 --> 00:06:13.490 because  
NOTE Confidence: 0.9946234

00:06:13.950 --> 00:06:15.810 you know, my great aunt received

NOTE Confidence: 0.9946234  
00:06:15.870 --> 00:06:18.050 that and had some terrible  
NOTE Confidence: 0.9946234  
00:06:18.190 --> 00:06:18.690 problems.  
NOTE Confidence: 0.99660337  
00:06:19.964 --> 00:06:21.265 What are the specific  
NOTE Confidence: 0.99950325  
00:06:22.205 --> 00:06:22.705 misunderstandings  
NOTE Confidence: 0.99632317  
00:06:23.085 --> 00:06:23.904 about radiation?  
NOTE Confidence: 0.98822945  
00:06:24.925 --> 00:06:26.125 Well, I think that  
NOTE Confidence: 0.9745357  
00:06:27.005 --> 00:06:27.725 one is,  
NOTE Confidence: 0.95722365  
00:06:28.285 --> 00:06:29.805 what we're alluding to before  
NOTE Confidence: 0.95722365  
00:06:29.805 --> 00:06:30.785 is, you know,  
NOTE Confidence: 0.9394385  
00:06:31.165 --> 00:06:33.325 historically, some people may remember  
NOTE Confidence: 0.9394385  
00:06:33.325 --> 00:06:33.825 that  
NOTE Confidence: 0.9797391  
00:06:34.320 --> 00:06:35.680 people treated with sort of  
NOTE Confidence: 0.9797391  
00:06:35.680 --> 00:06:37.440 the older fashioned ways of  
NOTE Confidence: 0.9797391  
00:06:37.440 --> 00:06:38.980 giving radiation developed  
NOTE Confidence: 0.9956814  
00:06:39.440 --> 00:06:40.260 skin burns  
NOTE Confidence: 0.8237263

00:06:41.199 --> 00:06:41.699 that  
NOTE Confidence: 0.93189037

00:06:43.040 --> 00:06:45.199 were very challenging to treat  
NOTE Confidence: 0.93189037

00:06:45.199 --> 00:06:46.580 and to heal. But  
NOTE Confidence: 0.94406825

00:06:47.040 --> 00:06:48.320 the advances that we just  
NOTE Confidence: 0.94406825

00:06:48.320 --> 00:06:49.620 talked about in  
NOTE Confidence: 0.91923016

00:06:50.295 --> 00:06:52.714 delivery of radiation more deeply  
NOTE Confidence: 0.91923016

00:06:52.855 --> 00:06:54.295 into the body and sparing  
NOTE Confidence: 0.91923016

00:06:54.295 --> 00:06:55.995 the skin with shape beams,  
NOTE Confidence: 0.9983781

00:06:57.335 --> 00:06:59.035 has allowed us to substantially  
NOTE Confidence: 0.9983852

00:06:59.415 --> 00:06:59.915 avoid  
NOTE Confidence: 0.8830166

00:07:00.855 --> 00:07:01.755 the skin damage  
NOTE Confidence: 0.9420005

00:07:02.250 --> 00:07:02.990 and also  
NOTE Confidence: 0.9676184

00:07:03.370 --> 00:07:04.830 side effects to other  
NOTE Confidence: 0.9945199

00:07:05.450 --> 00:07:05.950 tissues.  
00:07:08.330 --> 00:07:10.030 And I'm not saying that doesn't sometimes  
NOTE Confidence: 0.9236667

00:07:10.090 --> 00:07:11.450 happen. There  
NOTE Confidence: 0.9901239



00:07:11.850 --> 00:07:12.830 can be some  
NOTE Confidence: 0.94182724

00:07:13.210 --> 00:07:14.330 side effects to the skin,  
NOTE Confidence: 0.94182724

00:07:14.330 --> 00:07:15.690 but it's much much  
NOTE Confidence: 0.94182724

00:07:15.690 --> 00:07:17.050 less than it used to be for  
00:07:18.235 --> 00:07:19.354 the skin and for  
NOTE Confidence: 0.9297714

00:07:19.354 --> 00:07:21.615 that matter, other organs too.  
NOTE Confidence: 0.9297714

00:07:23.194 --> 00:07:24.715 There is some  
NOTE Confidence: 0.97470784

00:07:25.115 --> 00:07:26.555 effect of radiation as it  
NOTE Confidence: 0.97470784

00:07:26.555 --> 00:07:28.414 passes through healthy tissue, and  
NOTE Confidence: 0.97470784

00:07:28.555 --> 00:07:29.995 sometimes that can lead to  
NOTE Confidence: 0.97470784

00:07:30.315 --> 00:07:32.074 some fatigue and temporary loss  
NOTE Confidence: 0.97470784

00:07:32.074 --> 00:07:32.655 of energy.  
NOTE Confidence: 0.95752877

00:07:33.530 --> 00:07:35.610 Sometimes, if patients are treated  
NOTE Confidence: 0.95752877

00:07:35.610 --> 00:07:37.130 in the area of the  
NOTE Confidence: 0.95752877

00:07:37.130 --> 00:07:38.330 head and neck, they may  
NOTE Confidence: 0.95752877

00:07:38.330 --> 00:07:39.710 develop dry mouth,  
NOTE Confidence: 0.9873238

00:07:40.730 --> 00:07:41.850 or if they're treated in  
NOTE Confidence: 0.9873238

00:07:41.850 --> 00:07:43.050 the GI tract, they may  
NOTE Confidence: 0.9873238

00:07:43.050 --> 00:07:44.110 have some symptoms  
NOTE Confidence: 0.9692505

00:07:45.050 --> 00:07:47.050 associated with that. But, usually  
NOTE Confidence: 0.9692505

00:07:47.050 --> 00:07:48.750 these symptoms fade over time.  
NOTE Confidence: 0.9692505

00:07:49.005 --> 00:07:49.885 What are some of the  
NOTE Confidence: 0.9692505

00:07:49.885 --> 00:07:51.585 most common uses of radiation?  
NOTE Confidence: 0.98433125

00:07:52.045 --> 00:07:53.485 About sixty percent of all  
NOTE Confidence: 0.98433125

00:07:53.485 --> 00:07:54.305 cancer patients  
NOTE Confidence: 0.9258269

00:07:54.685 --> 00:07:56.545 are treated with radiation and  
00:07:57.805 --> 00:07:59.325 many different types of tumors  
NOTE Confidence: 0.9985477

00:07:59.325 --> 00:07:59.985 are treated.

00:08:03.520 --> 00:08:05.199 One very common treatment is for  
NOTE Confidence: 0.9600044

00:08:05.199 --> 00:08:06.240 cancers of the head and  
NOTE Confidence: 0.9600044

00:08:06.240 --> 00:08:09.039 neck where radiation is considered  
NOTE Confidence: 0.9600044

00:08:09.039 --> 00:08:11.280 a curative treatment often in  
NOTE Confidence: 0.9600044

00:08:11.280 --> 00:08:12.580 combination with chemotherapy.

NOTE Confidence: 0.9988892  
00:08:13.360 --> 00:08:14.240 We do a lot of  
NOTE Confidence: 0.9988892  
00:08:14.240 --> 00:08:16.159 radiation treatments for breast cancer,  
NOTE Confidence: 0.9988892  
00:08:16.159 --> 00:08:17.379 prostate cancer,  
NOTE Confidence: 0.9940846  
00:08:18.014 --> 00:08:18.755 brain tumors,  
NOTE Confidence: 0.95504797  
00:08:19.775 --> 00:08:21.535 and, tumors of the GI  
NOTE Confidence: 0.95504797  
00:08:21.535 --> 00:08:22.915 tract. I mentioned  
NOTE Confidence: 0.8422987  
00:08:24.574 --> 00:08:25.074 gynecologic  
NOTE Confidence: 0.9995365  
00:08:25.375 --> 00:08:25.875 malignancies  
NOTE Confidence: 0.88905346  
00:08:26.414 --> 00:08:28.835 where radiation is very effective  
00:08:30.095 --> 00:08:31.235 and routinely achieves  
NOTE Confidence: 0.9943047  
00:08:32.000 --> 00:08:33.440 curative effect in many of  
NOTE Confidence: 0.9943047  
00:08:33.440 --> 00:08:34.179 those scenarios.  
NOTE Confidence: 0.99261093  
00:08:34.800 --> 00:08:36.400 And in some cases, these are  
00:08:37.280 --> 00:08:39.440 a substitute for  
NOTE Confidence: 0.97567236  
00:08:39.440 --> 00:08:41.059 surgery, and in some cases,  
NOTE Confidence: 0.97567236  
00:08:41.120 --> 00:08:42.880 it's done in conjunction with  
NOTE Confidence: 0.97567236

00:08:42.880 --> 00:08:44.320 surgery.  
NOTE Confidence: 0.97567236

00:08:44.480 --> 00:08:45.300 Radiation  
NOTE Confidence: 0.998683

00:08:46.005 --> 00:08:48.184 is particularly effective for localized  
NOTE Confidence: 0.998683

00:08:48.325 --> 00:08:48.825 disease  
NOTE Confidence: 0.9526823

00:08:49.365 --> 00:08:50.745 and can be an alternative  
NOTE Confidence: 0.9526823

00:08:50.804 --> 00:08:52.425 to surgery in some cases,  
NOTE Confidence: 0.9876934

00:08:52.965 --> 00:08:55.125 either because the individual is  
NOTE Confidence: 0.9876934

00:08:55.125 --> 00:08:56.745 not medically able to undergo an  
00:08:58.720 --> 00:08:59.220 operation,  
NOTE Confidence: 0.9687984

00:09:00.320 --> 00:09:01.059 or because the  
00:09:03.200 --> 00:09:04.720 morbidity or side effects  
NOTE Confidence: 0.97721654

00:09:04.720 --> 00:09:06.480 of getting radiation may actually be  
00:09:07.679 --> 00:09:09.779 more favorable than a surgical  
NOTE Confidence: 0.976867

00:09:09.840 --> 00:09:10.340 intervention.  
NOTE Confidence: 0.9577737

00:09:10.720 --> 00:09:12.179 Not so many years ago  
NOTE Confidence: 0.9577737

00:09:12.320 --> 00:09:14.445 when someone would have cancer  
NOTE Confidence: 0.9577737

00:09:14.445 --> 00:09:16.285 that unfortunately would spread to  
NOTE Confidence: 0.9577737

00:09:16.285 --> 00:09:17.184 their brain,  
NOTE Confidence: 0.9250838  
00:09:18.285 --> 00:09:19.965 they very commonly would  
NOTE Confidence: 0.9250838  
00:09:20.125 --> 00:09:20.945 get radiation  
NOTE Confidence: 0.96504647  
00:09:21.885 --> 00:09:23.645 to the entire brain, to  
NOTE Confidence: 0.96504647  
00:09:23.645 --> 00:09:25.184 the whole head essentially.  
NOTE Confidence: 0.9492086  
00:09:26.399 --> 00:09:27.059 And increasingly  
NOTE Confidence: 0.95638186  
00:09:27.920 --> 00:09:29.600 over the years, it seems  
NOTE Confidence: 0.95638186  
00:09:29.600 --> 00:09:30.879 that that's not the case,  
NOTE Confidence: 0.95638186  
00:09:30.879 --> 00:09:32.339 and treatments that are  
NOTE Confidence: 0.99783605  
00:09:32.720 --> 00:09:34.019 referred to as either  
NOTE Confidence: 0.7908092  
00:09:34.399 --> 00:09:35.620 stereotactic  
NOTE Confidence: 0.98678154  
00:09:36.000 --> 00:09:36.500 radiosurgery  
NOTE Confidence: 0.985683  
00:09:36.879 --> 00:09:38.205 or gamma knife  
NOTE Confidence: 0.99732584  
00:09:38.765 --> 00:09:40.765 have been used and have  
NOTE Confidence: 0.99732584  
00:09:40.765 --> 00:09:41.825 been very effective.  
NOTE Confidence: 0.99917096  
00:09:42.205 --> 00:09:42.925 Can you tell us a

NOTE Confidence: 0.99917096

00:09:42.925 --> 00:09:44.865 little bit about those treatments?

NOTE Confidence: 0.9870305

00:09:45.405 --> 00:09:47.085 Yes, you're absolutely

NOTE Confidence: 0.9870305

00:09:47.085 --> 00:09:47.885 right that

NOTE Confidence: 0.9991121

00:09:48.285 --> 00:09:49.665 years ago for

NOTE Confidence: 0.96656483

00:09:50.125 --> 00:09:52.465 metastases in the brain,

NOTE Confidence: 0.96656483

00:09:52.690 --> 00:09:53.730 treatment would be given to

NOTE Confidence: 0.96656483

00:09:53.730 --> 00:09:54.610 what we call the whole

NOTE Confidence: 0.96656483

00:09:54.610 --> 00:09:56.130 brain, which is basically the

NOTE Confidence: 0.96656483

00:09:56.130 --> 00:09:56.630 upper

NOTE Confidence: 0.95752054

00:09:57.090 --> 00:09:58.610 part of the head through

NOTE Confidence: 0.95752054

00:09:58.610 --> 00:10:00.770 and through. But the advances

NOTE Confidence: 0.95752054

00:10:00.770 --> 00:10:02.130 that I was alluding to

NOTE Confidence: 0.95752054

00:10:02.130 --> 00:10:02.790 in terms

NOTE Confidence: 0.9142076

00:10:03.810 --> 00:10:05.250 of the technology, the treatment

NOTE Confidence: 0.9142076

00:10:05.250 --> 00:10:07.350 machines, and also specialized devices

NOTE Confidence: 0.9142076

00:10:07.410 --> 00:10:08.475 like the gamma knife,  
NOTE Confidence: 0.97546625

00:10:09.115 --> 00:10:11.675 allows very focused treatment of  
NOTE Confidence: 0.97546625

00:10:11.675 --> 00:10:13.535 individual metastatic lesions,  
NOTE Confidence: 0.9834915

00:10:15.194 --> 00:10:17.434 with really exquisite precision that  
NOTE Confidence: 0.9834915

00:10:17.434 --> 00:10:17.934 allow  
NOTE Confidence: 0.91441107

00:10:18.394 --> 00:10:19.694 a good deal of sparing  
NOTE Confidence: 0.98717517

00:10:19.995 --> 00:10:22.415 of the surrounding healthy brain.  
NOTE Confidence: 0.99499047

00:10:22.850 --> 00:10:24.210 So now it's pretty much  
NOTE Confidence: 0.99499047

00:10:24.210 --> 00:10:25.750 standard of care to  
NOTE Confidence: 0.9459065

00:10:26.130 --> 00:10:26.530 treat  
NOTE Confidence: 0.949018

00:10:27.170 --> 00:10:29.590 the metastatic lesions fairly aggressively,  
NOTE Confidence: 0.949018

00:10:29.650 --> 00:10:31.350 but with highly focused treatment.  
NOTE Confidence: 0.96002936

00:10:32.050 --> 00:10:33.410 And the Gamma Knife actually  
NOTE Confidence: 0.96002936

00:10:33.410 --> 00:10:34.210 is one of the best  
NOTE Confidence: 0.96002936

00:10:34.210 --> 00:10:35.490 devices to do that for  
NOTE Confidence: 0.96002936

00:10:35.490 --> 00:10:37.250 brain lesions because of its

NOTE Confidence: 0.96002936  
00:10:37.490 --> 00:10:38.150 high precision.  
NOTE Confidence: 0.9973461  
00:10:38.795 --> 00:10:40.415 I mean, this has really  
NOTE Confidence: 0.99879444  
00:10:41.195 --> 00:10:41.695 transformed  
NOTE Confidence: 0.9757833  
00:10:41.995 --> 00:10:43.455 in many ways the treatment  
NOTE Confidence: 0.9757833  
00:10:43.515 --> 00:10:44.875 of cancer that has spread  
NOTE Confidence: 0.9757833  
00:10:44.875 --> 00:10:45.695 to the brain  
NOTE Confidence: 0.97081345  
00:10:46.155 --> 00:10:48.495 and has allowed people to  
NOTE Confidence: 0.93759453  
00:10:48.875 --> 00:10:50.395 live longer and at the  
NOTE Confidence: 0.93759453  
00:10:50.395 --> 00:10:52.415 same time live much better.  
00:10:54.149 --> 00:10:56.309 And it's become especially important as systemic  
NOTE Confidence: 0.96311754  
00:10:56.309 --> 00:10:57.529 therapies have improved.  
NOTE Confidence: 0.91747177  
00:10:58.629 --> 00:10:59.990 So now we are taking  
00:11:01.670 --> 00:11:02.490 a more aggressive  
NOTE Confidence: 0.9514476  
00:11:02.870 --> 00:11:05.050 approach to trying to  
NOTE Confidence: 0.9710512  
00:11:06.069 --> 00:11:08.089 treat lesions in the brain  
NOTE Confidence: 0.9973655  
00:11:08.415 --> 00:11:10.334 when the systemic disease can  
NOTE Confidence: 0.9973655



00:11:10.334 --> 00:11:11.955 be controlled by other approaches.

NOTE Confidence: 0.9815845

00:11:12.415 --> 00:11:13.535 It seems that there are

NOTE Confidence: 0.9815845

00:11:13.535 --> 00:11:16.575 even newer approaches, and you

NOTE Confidence: 0.9815845

00:11:16.575 --> 00:11:17.714 have a new machine

NOTE Confidence: 0.9997485

00:11:18.415 --> 00:11:19.154 that gives

NOTE Confidence: 0.94129336

00:11:19.535 --> 00:11:20.834 guided radiation.

NOTE Confidence: 0.9819255

00:11:21.375 --> 00:11:22.760 And maybe you can tell

NOTE Confidence: 0.9819255

00:11:22.760 --> 00:11:23.720 us a little bit about

NOTE Confidence: 0.9819255

00:11:23.720 --> 00:11:24.460 that, and what

00:11:25.960 --> 00:11:27.240 kind of guidance is used?

00:11:29.080 --> 00:11:30.920 This is along the lines of what

NOTE Confidence: 0.9830408

00:11:30.920 --> 00:11:32.600 we call image guided therapy,

NOTE Confidence: 0.9830408

00:11:32.600 --> 00:11:34.200 in which the linear

NOTE Confidence: 0.9830408

00:11:34.200 --> 00:11:36.280 accelerators have an onboard imaging

NOTE Confidence: 0.9830408

00:11:36.280 --> 00:11:37.420 device to help

NOTE Confidence: 0.8992373

00:11:38.735 --> 00:11:39.635 us evaluate

NOTE Confidence: 0.9111177

00:11:40.735 --> 00:11:42.035 and modify the treatment

NOTE Confidence: 0.95318735  
00:11:42.775 --> 00:11:44.095 at the time  
NOTE Confidence: 0.95318735  
00:11:44.095 --> 00:11:44.755 the patient  
NOTE Confidence: 0.8905596  
00:11:46.175 --> 00:11:47.695 is in the machine and  
NOTE Confidence: 0.8905596  
00:11:47.695 --> 00:11:49.295 in some cases almost in  
NOTE Confidence: 0.8905596  
00:11:49.295 --> 00:11:50.115 real time.  
NOTE Confidence: 0.95348525  
00:11:51.160 --> 00:11:53.400 This approach started with CT  
NOTE Confidence: 0.95348525  
00:11:53.400 --> 00:11:55.260 scan and MR scan,  
NOTE Confidence: 0.9444651  
00:11:56.280 --> 00:11:58.040 included in Lenox, but this  
NOTE Confidence: 0.9444651  
00:11:58.040 --> 00:12:00.620 new biologically guided therapy incorporates  
NOTE Confidence: 0.9444651  
00:12:00.760 --> 00:12:02.360 a PET scanner or PET  
NOTE Confidence: 0.9444651  
00:12:02.360 --> 00:12:04.155 imager in the device. NOTE Confidence:  
0.9444651  
00:12:04.315 --> 00:12:05.855 A PET scanner image  
NOTE Confidence: 0.99297106  
00:12:06.875 --> 00:12:09.375 positron emissions from radioactive tracers  
NOTE Confidence: 0.8908592  
00:12:10.235 --> 00:12:10.555 that  
NOTE Confidence: 0.97445685  
00:12:11.115 --> 00:12:12.975 accumulate in the tumor when  
NOTE Confidence: 0.97445685

00:12:13.035 --> 00:12:13.515 certain  
NOTE Confidence: 0.9813031

00:12:13.915 --> 00:12:15.115 compounds are given to the  
NOTE Confidence: 0.9813031

00:12:15.115 --> 00:12:16.800 patient ahead of time. And  
NOTE Confidence: 0.9813031

00:12:16.800 --> 00:12:18.880 that allows us to account  
NOTE Confidence: 0.9813031

00:12:18.880 --> 00:12:20.880 for the localization of the  
NOTE Confidence: 0.9813031

00:12:20.880 --> 00:12:21.380 tumor,  
NOTE Confidence: 0.96417683

00:12:22.480 --> 00:12:24.240 and also its motion within  
NOTE Confidence: 0.96417683

00:12:24.240 --> 00:12:25.600 the patient, and in some  
NOTE Confidence: 0.96417683

00:12:25.600 --> 00:12:27.520 cases depending on the tracer  
NOTE Confidence: 0.96417683

00:12:27.520 --> 00:12:28.740 we use on its biological  
NOTE Confidence: 0.96417683

00:12:28.960 --> 00:12:29.460 properties.  
NOTE Confidence: 0.985

00:12:30.080 --> 00:12:31.460 And then we can modify  
NOTE Confidence: 0.89966303

00:12:32.615 --> 00:12:34.074 the treatment, beamlets,  
NOTE Confidence: 0.9453735

00:12:34.934 --> 00:12:36.375 in real time based on  
NOTE Confidence: 0.9453735

00:12:36.375 --> 00:12:38.154 the positron emission pattern.  
NOTE Confidence: 0.9723301

00:12:39.014 --> 00:12:40.855 How much experience have

NOTE Confidence: 0.9723301  
00:12:40.855 --> 00:12:41.815 you had with this so far?  
NOTE Confidence: 0.9723301  
00:12:41.815 --> 00:12:43.735 We've had it going  
NOTE Confidence: 0.9723301  
00:12:43.735 --> 00:12:45.334 for about a year, and  
NOTE Confidence: 0.9839964  
00:12:46.380 --> 00:12:47.740 actually, I think we have  
NOTE Confidence: 0.9839964  
00:12:47.740 --> 00:12:49.200 one of the largest experiences  
NOTE Confidence: 0.9839964  
00:12:49.340 --> 00:12:50.300 in the country with this.  
NOTE Confidence: 0.9839964  
00:12:50.300 --> 00:12:52.240 So we're getting more familiar  
NOTE Confidence: 0.9839964  
00:12:52.300 --> 00:12:53.420 with how to best  
NOTE Confidence: 0.9870507  
00:12:54.220 --> 00:12:56.160 incorporate this technology into  
NOTE Confidence: 0.9992642  
00:12:56.780 --> 00:12:58.000 our treatment of patients.  
NOTE Confidence: 0.9853009  
00:12:58.540 --> 00:13:00.720 So it's really  
NOTE Confidence: 0.99872905  
00:13:01.245 --> 00:13:02.865 taking the treatment even  
NOTE Confidence: 0.999399  
00:13:03.325 --> 00:13:04.765 a step further than you  
NOTE Confidence: 0.999399  
00:13:04.765 --> 00:13:06.365 would with just a CT  
NOTE Confidence: 0.999399  
00:13:06.365 --> 00:13:07.265 scan alone  
NOTE Confidence: 0.71420646

00:13:07.725 --> 00:13:08.545 because with  
NOTE Confidence: 0.9861991

00:13:09.005 --> 00:13:10.045 the PET part of that  
NOTE Confidence: 0.9861991

00:13:10.045 --> 00:13:11.565 imaging, you can tell much  
NOTE Confidence: 0.9861991

00:13:11.565 --> 00:13:12.925 more about what's going on  
NOTE Confidence: 0.9861991

00:13:12.925 --> 00:13:14.285 in the tumor.  
NOTE Confidence: 0.9861991

00:13:14.285 --> 00:13:15.405 It has a new dimension.  
NOTE Confidence: 0.9861991

00:13:15.405 --> 00:13:17.149 Right now, it's primarily  
NOTE Confidence: 0.9861991

00:13:17.370 --> 00:13:19.370 valuable for accounting for  
NOTE Confidence: 0.9861991

00:13:19.370 --> 00:13:21.449 motion, especially lesions in the  
NOTE Confidence: 0.9861991

00:13:21.449 --> 00:13:22.910 lung where you have breathing,  
NOTE Confidence: 0.9509913

00:13:23.850 --> 00:13:25.129 the breathing cycle that  
NOTE Confidence: 0.9509913

00:13:25.129 --> 00:13:26.029 causes motion.  
NOTE Confidence: 0.99434924

00:13:26.970 --> 00:13:28.649 But we think that down  
NOTE Confidence: 0.99434924

00:13:28.649 --> 00:13:29.610 the road, we will have  
NOTE Confidence: 0.99434924

00:13:29.610 --> 00:13:31.129 many other applications of the  
NOTE Confidence: 0.99434924

00:13:31.129 --> 00:13:31.629 technology.

NOTE Confidence: 0.99155134

00:13:32.865 --> 00:13:34.065 Well, this is great. We're

NOTE Confidence: 0.99155134

00:13:34.065 --> 00:13:35.265 gonna take a break for

NOTE Confidence: 0.99155134

00:13:35.265 --> 00:13:36.545 just a minute. And when

NOTE Confidence: 0.99155134

00:13:36.545 --> 00:13:37.745 we come back, we're gonna

NOTE Confidence: 0.99155134

00:13:37.745 --> 00:13:39.525 talk a little more about

NOTE Confidence: 0.99155134

00:13:39.585 --> 00:13:41.265 how radiation works, and then

NOTE Confidence: 0.99155134

00:13:41.265 --> 00:13:42.705 we're gonna get into some

NOTE Confidence: 0.99155134

00:13:42.705 --> 00:13:44.245 of the research you've done

NOTE Confidence: 0.99155134

00:13:44.304 --> 00:13:45.365 related to that.

NOTE Confidence: 0.98519945

00:13:45.970 --> 00:13:47.650 Support for Yale Cancer Answers

NOTE Confidence: 0.98519945

00:13:47.650 --> 00:13:49.590 comes from Smilow Cancer Hospital,

NOTE Confidence: 0.98519945

00:13:49.890 --> 00:13:51.650 where all patients have access

NOTE Confidence: 0.98519945

00:13:51.650 --> 00:13:53.250 to cutting edge clinical trials

NOTE Confidence: 0.98519945

00:13:53.250 --> 00:13:55.330 at several convenient locations throughout

NOTE Confidence: 0.98519945

00:13:55.330 --> 00:13:55.990 the region.

NOTE Confidence: 0.9647773

00:13:56.370 --> 00:13:57.990 To learn more, visit [smilowcancer](http://smilowcancerhospital.org)  
NOTE Confidence: 0.9825418

00:13:58.370 --> 00:13:59.750 [hospital dot org](http://smilowcancerhospital.org).  
NOTE Confidence: 0.98799294

00:14:01.904 --> 00:14:04.225 The American Cancer Society estimates  
NOTE Confidence: 0.98799294

00:14:04.225 --> 00:14:05.345 that nearly one hundred and  
NOTE Confidence: 0.98799294

00:14:05.345 --> 00:14:06.704 fifty thousand people in the  
NOTE Confidence: 0.98799294

00:14:06.704 --> 00:14:08.005 U. S. will be diagnosed  
NOTE Confidence: 0.98799294

00:14:08.065 --> 00:14:10.065 with colorectal cancer this year  
NOTE Confidence: 0.98799294

00:14:10.065 --> 00:14:10.565 alone.  
NOTE Confidence: 0.9882225

00:14:11.024 --> 00:14:13.265 When detected early, colorectal cancer  
NOTE Confidence: 0.9882225

00:14:13.265 --> 00:14:14.945 is easily treated and highly  
NOTE Confidence: 0.9882225

00:14:14.945 --> 00:14:15.445 curable,  
NOTE Confidence: 0.9989449

00:14:15.860 --> 00:14:16.900 and men and women over  
NOTE Confidence: 0.9989449

00:14:16.900 --> 00:14:18.020 the age of forty five  
NOTE Confidence: 0.9989449

00:14:18.020 --> 00:14:19.400 should have regular colonoscopies  
NOTE Confidence: 0.99939996

00:14:19.860 --> 00:14:21.080 to screen for the disease.  
NOTE Confidence: 0.9896938

00:14:21.700 --> 00:14:23.620 Patients with colorectal cancer have

NOTE Confidence: 0.9896938  
00:14:23.620 --> 00:14:25.080 more hope than ever before,  
NOTE Confidence: 0.9896938  
00:14:25.300 --> 00:14:26.980 thanks to increased access to  
NOTE Confidence: 0.9896938  
00:14:26.980 --> 00:14:29.640 advanced therapies and specialized care.  
NOTE Confidence: 0.95140123  
00:14:30.075 --> 00:14:31.835 Clinical trials are currently underway  
NOTE Confidence: 0.95140123  
00:14:31.835 --> 00:14:34.475 at federally designated comprehensive cancer  
NOTE Confidence: 0.95140123  
00:14:34.475 --> 00:14:36.315 centers, such as Yale Cancer  
NOTE Confidence: 0.95140123  
00:14:36.315 --> 00:14:37.995 Center and Smilow Cancer  
NOTE Confidence: 0.95140123  
00:14:37.995 --> 00:14:38.495 Hospital,  
NOTE Confidence: 0.9975308  
00:14:38.795 --> 00:14:40.475 to test innovative new treatments  
NOTE Confidence: 0.9975308  
00:14:40.475 --> 00:14:41.855 for colorectal cancer.  
NOTE Confidence: 0.9973013  
00:14:42.380 --> 00:14:44.459 Tumor gene analysis has helped  
NOTE Confidence: 0.9973013  
00:14:44.459 --> 00:14:46.720 improve management of colorectal cancer  
NOTE Confidence: 0.9973013  
00:14:46.940 --> 00:14:48.940 by identifying the patients most  
NOTE Confidence: 0.9973013  
00:14:48.940 --> 00:14:50.800 likely to benefit from chemotherapy  
NOTE Confidence: 0.97905904  
00:14:51.420 --> 00:14:53.899 and newer targeted agents resulting  
NOTE Confidence: 0.97905904



00:14:53.899 --> 00:14:55.680 in more patient specific treatment.

NOTE Confidence: 0.989866

00:14:56.445 --> 00:14:57.965 More information is available at

NOTE Confidence: 0.989866

00:14:57.965 --> 00:14:59.825 yale cancer center dot org.

NOTE Confidence: 0.989866

00:14:59.965 --> 00:15:01.725 You're listening to Connecticut Public

NOTE Confidence: 0.989866

00:15:01.725 --> 00:15:02.225 Radio.

NOTE Confidence: 0.9676658

00:15:03.005 --> 00:15:04.445 Good evening again. This is

NOTE Confidence: 0.9676658

00:15:04.445 --> 00:15:06.365 Eric Winer with Yale Cancer

NOTE Confidence: 0.9676658

00:15:06.365 --> 00:15:08.705 Answers, and I'm here tonight

NOTE Confidence: 0.9676658

00:15:08.845 --> 00:15:10.305 with my guest,

NOTE Confidence: 0.9378652

00:15:10.800 --> 00:15:12.100 doctor Peter Glazer,

NOTE Confidence: 0.99806845

00:15:12.560 --> 00:15:14.100 who is a professor of

00:15:15.760 --> 00:15:17.840 therapeutic radiology and a professor

NOTE Confidence: 0.9869278

00:15:17.840 --> 00:15:19.200 of genetics here at Yale

NOTE Confidence: 0.9869278

00:15:19.200 --> 00:15:20.740 School of Medicine and chair

NOTE Confidence: 0.9994871

00:15:21.600 --> 00:15:23.060 of therapeutic radiology.

NOTE Confidence: 0.9994349

00:15:23.680 --> 00:15:24.960 Can you tell us a

NOTE Confidence: 0.9994349

00:15:24.960 --> 00:15:25.779 little bit  
NOTE Confidence: 0.9997471

00:15:26.355 --> 00:15:26.855 about  
NOTE Confidence: 0.9997988

00:15:27.155 --> 00:15:28.935 how it is that radiation  
NOTE Confidence: 0.9926603

00:15:29.475 --> 00:15:31.335 on a cellular  
NOTE Confidence: 0.9926603

00:15:31.475 --> 00:15:31.975 level  
NOTE Confidence: 0.9949279

00:15:32.275 --> 00:15:34.035 kills cancer cells? What does  
NOTE Confidence: 0.9949279

00:15:34.035 --> 00:15:35.555 it do that makes  
NOTE Confidence: 0.9949279

00:15:35.555 --> 00:15:36.455 them die?  
00:15:38.195 --> 00:15:38.695 The radiation  
NOTE Confidence: 0.96470606

00:15:39.075 --> 00:15:40.215 that we use  
NOTE Confidence: 0.84999245

00:15:40.959 --> 00:15:42.399 clinically to treat cancer is  
NOTE Confidence: 0.84999245

00:15:42.399 --> 00:15:42.899 sometimes  
NOTE Confidence: 0.9944219

00:15:43.279 --> 00:15:43.779 classified  
NOTE Confidence: 0.9985743

00:15:44.080 --> 00:15:45.540 as ionizing radiation  
NOTE Confidence: 0.9275751

00:15:46.080 --> 00:15:48.320 to differentiate it from other  
NOTE Confidence: 0.9275751

00:15:48.320 --> 00:15:49.220 forms of  
NOTE Confidence: 0.87444776

00:15:50.959 --> 00:15:52.880 radiation including photons, which is

NOTE Confidence: 0.87444776

00:15:52.880 --> 00:15:53.860 visible light.

00:15:55.764 --> 00:15:56.964 And what that means is

NOTE Confidence: 0.95287067

00:15:56.964 --> 00:15:59.305 that the radiation, x-ray radiation

NOTE Confidence: 0.95287067

00:15:59.365 --> 00:16:01.385 goes into cancer cells

NOTE Confidence: 0.98957825

00:16:02.005 --> 00:16:03.845 and causes ionization of the

NOTE Confidence: 0.98957825

00:16:03.845 --> 00:16:04.345 molecules

NOTE Confidence: 0.98295987

00:16:04.885 --> 00:16:06.644 inside the cell, and that

NOTE Confidence: 0.98295987

00:16:06.644 --> 00:16:07.685 leads to a lot of

NOTE Confidence: 0.98295987

00:16:07.685 --> 00:16:09.445 chemical reactions that damage the

NOTE Confidence: 0.98295987

00:16:09.445 --> 00:16:09.945 DNA.

NOTE Confidence: 0.8771124

00:16:10.770 --> 00:16:11.510 So fundamentally,

NOTE Confidence: 0.996021

00:16:11.810 --> 00:16:13.810 radiation causes DNA damage in

NOTE Confidence: 0.996021

00:16:13.810 --> 00:16:14.710 cancer cells

NOTE Confidence: 0.9020197

00:16:15.170 --> 00:16:16.550 and if we can provide

NOTE Confidence: 0.9020197

00:16:16.610 --> 00:16:18.950 sufficient damage, the cells cannot

NOTE Confidence: 0.9882677

00:16:20.130 --> 00:16:22.050 fix themselves well enough to  
NOTE Confidence: 0.9882677

00:16:22.050 --> 00:16:22.550 recover  
NOTE Confidence: 0.94986635

00:16:22.975 --> 00:16:24.495 and that leads to a  
NOTE Confidence: 0.94986635

00:16:24.495 --> 00:16:26.095 destruction of the tumor and  
NOTE Confidence: 0.94986635

00:16:26.335 --> 00:16:27.235 tumor regression.  
NOTE Confidence: 0.9883442

00:16:27.935 --> 00:16:29.795 And the DNA is essentially  
NOTE Confidence: 0.93754345

00:16:30.415 --> 00:16:31.615 the brain of the cancer cell?  
NOTE Confidence: 0.93754345

00:16:31.615 --> 00:16:33.455 Yes, DNA  
NOTE Confidence: 0.93754345

00:16:33.455 --> 00:16:35.135 as in all cells, has  
NOTE Confidence: 0.93754345

00:16:35.135 --> 00:16:36.815 the blueprint for how a  
NOTE Confidence: 0.93754345

00:16:36.815 --> 00:16:37.555 cell functions,  
NOTE Confidence: 0.99932164

00:16:38.310 --> 00:16:39.930 and DNA  
NOTE Confidence: 0.9841659

00:16:40.390 --> 00:16:41.750 leads to the production of  
NOTE Confidence: 0.9841659

00:16:41.750 --> 00:16:43.670 downstream molecules like RNA and  
NOTE Confidence: 0.9841659

00:16:43.670 --> 00:16:45.270 proteins. So if you get  
NOTE Confidence: 0.9841659

00:16:45.270 --> 00:16:46.890 the DNA, then you basically

NOTE Confidence: 0.9841659  
00:16:46.950 --> 00:16:48.730 block all cellular functions  
NOTE Confidence: 0.9977467  
00:16:49.110 --> 00:16:50.070 and the ability of the  
NOTE Confidence: 0.9977467  
00:16:50.070 --> 00:16:50.970 cell to survive.  
NOTE Confidence: 0.9934935  
00:16:51.430 --> 00:16:52.870 Now one of the things  
NOTE Confidence: 0.9934935  
00:16:52.870 --> 00:16:53.370 that  
NOTE Confidence: 0.99040234  
00:16:54.105 --> 00:16:55.625 one hears as a doctor  
NOTE Confidence: 0.99040234  
00:16:55.625 --> 00:16:57.404 from patients is the question,  
NOTE Confidence: 0.9980239  
00:16:57.705 --> 00:16:59.005 well, doesn't radiation  
NOTE Confidence: 0.9844425  
00:16:59.464 --> 00:17:00.445 cause cancer?  
NOTE Confidence: 0.9919805  
00:17:01.065 --> 00:17:02.665 And I think people are  
NOTE Confidence: 0.9919805  
00:17:02.665 --> 00:17:03.964 often thinking about  
NOTE Confidence: 0.9630483  
00:17:04.984 --> 00:17:06.825 the fact that, you know,  
NOTE Confidence: 0.9630483  
00:17:06.825 --> 00:17:07.325 repeated,  
NOTE Confidence: 0.984136  
00:17:08.800 --> 00:17:11.040 imaging studies are associated with  
NOTE Confidence: 0.984136  
00:17:11.040 --> 00:17:12.560 a very small increased risk  
NOTE Confidence: 0.984136

00:17:12.560 --> 00:17:14.420 in cancer in certain circumstances.

NOTE Confidence: 0.977119

00:17:15.680 --> 00:17:17.119 Is that a question that

NOTE Confidence: 0.977119

00:17:17.119 --> 00:17:18.560 that all of you get

NOTE Confidence: 0.977119

00:17:18.560 --> 00:17:20.160 asked a fair amount?

NOTE Confidence: 0.977119

00:17:20.160 --> 00:17:21.680 Yes. We sometimes talk about

NOTE Confidence: 0.977119

00:17:21.680 --> 00:17:23.415 that with patients. I

NOTE Confidence: 0.977119

00:17:23.415 --> 00:17:24.615 I think that it, you

NOTE Confidence: 0.977119

00:17:24.615 --> 00:17:26.475 know, it is known that

NOTE Confidence: 0.99857396

00:17:26.855 --> 00:17:28.135 there is a link between

NOTE Confidence: 0.99857396

00:17:28.135 --> 00:17:29.994 radiation exposure and

NOTE Confidence: 0.7502995

00:17:30.535 --> 00:17:31.755 developing malignancies.

NOTE Confidence: 0.9918907

00:17:32.455 --> 00:17:33.415 I think this is one

NOTE Confidence: 0.9918907

00:17:33.415 --> 00:17:34.075 of the

NOTE Confidence: 0.9806618

00:17:34.535 --> 00:17:35.975 key reasons that we've worked

NOTE Confidence: 0.9806618

00:17:35.975 --> 00:17:37.515 so hard to develop technologies

NOTE Confidence: 0.9806618

00:17:37.734 --> 00:17:39.180 that focus the radiation

NOTE Confidence: 0.977048  
00:17:40.040 --> 00:17:41.660 intensively on the tumor and  
00:17:43.160 --> 00:17:44.440 work to spare the healthy  
NOTE Confidence: 0.9967444  
00:17:44.440 --> 00:17:44.940 tissue  
NOTE Confidence: 0.99018466  
00:17:45.320 --> 00:17:46.540 as much as we can.  
NOTE Confidence: 0.9584448  
00:17:47.720 --> 00:17:49.160 And, you know, we've studied  
NOTE Confidence: 0.9584448  
00:17:49.160 --> 00:17:50.200 this a lot in the  
NOTE Confidence: 0.9584448  
00:17:50.200 --> 00:17:52.460 field, and the risk of  
NOTE Confidence: 0.99758375  
00:17:53.534 --> 00:17:54.514 secondary malignancies  
NOTE Confidence: 0.9791086  
00:17:54.894 --> 00:17:56.095 is not zero, but it's  
NOTE Confidence: 0.9791086  
00:17:56.095 --> 00:17:57.774 very low, especially for most  
NOTE Confidence: 0.9791086  
00:17:57.774 --> 00:17:58.595 adult patients.  
NOTE Confidence: 0.97777367  
00:17:59.215 --> 00:18:00.335 We worry a little bit  
NOTE Confidence: 0.97777367  
00:18:00.335 --> 00:18:01.934 more about children, which is  
NOTE Confidence: 0.97777367  
00:18:01.934 --> 00:18:03.294 one of the reasons that  
NOTE Confidence: 0.97777367  
00:18:03.294 --> 00:18:04.815 we spend a lot  
NOTE Confidence: 0.97777367  
00:18:04.815 --> 00:18:06.894 of time in developing treatment

NOTE Confidence: 0.97777367

00:18:06.894 --> 00:18:08.550 approaches for children that are

NOTE Confidence: 0.97777367

00:18:08.869 --> 00:18:10.490 very highly focused. And

NOTE Confidence: 0.99366283

00:18:10.950 --> 00:18:12.250 one of the more recent,

NOTE Confidence: 0.96687096

00:18:12.790 --> 00:18:14.390 two elements along those lines

NOTE Confidence: 0.96687096

00:18:14.390 --> 00:18:15.590 is the use of proton

NOTE Confidence: 0.96687096

00:18:15.590 --> 00:18:16.330 beam therapy,

NOTE Confidence: 0.996529

00:18:16.869 --> 00:18:17.350 which is

00:18:19.430 --> 00:18:21.190 especially valuable for treating

NOTE Confidence: 0.93894964

00:18:21.190 --> 00:18:21.690 children.

NOTE Confidence: 0.9790747

00:18:22.445 --> 00:18:22.945 And,

NOTE Confidence: 0.9902553

00:18:23.325 --> 00:18:24.765 there's gonna be a proton

NOTE Confidence: 0.9902553

00:18:24.765 --> 00:18:25.665 beam facility

NOTE Confidence: 0.99981683

00:18:26.125 --> 00:18:26.865 in Connecticut

NOTE Confidence: 0.97131664

00:18:27.244 --> 00:18:29.005 in the not distant future

NOTE Confidence: 0.97131664

00:18:29.005 --> 00:18:30.625 that we've been involved with.

NOTE Confidence: 0.97131664

00:18:30.685 --> 00:18:32.305 Protons



NOTE Confidence: 0.9501652  
00:18:33.645 --> 00:18:35.025 are a type of ionizing  
NOTE Confidence: 0.9501652  
00:18:35.165 --> 00:18:36.925 radiation, but instead of x  
NOTE Confidence: 0.9501652  
00:18:36.925 --> 00:18:37.770 rays, they use  
NOTE Confidence: 0.94872874  
00:18:38.170 --> 00:18:40.109 protons, which are a subatomic  
NOTE Confidence: 0.94872874  
00:18:40.250 --> 00:18:40.750 particle,  
NOTE Confidence: 0.86726725  
00:18:41.530 --> 00:18:43.470 which a machine  
NOTE Confidence: 0.86726725  
00:18:43.530 --> 00:18:45.230 called a cyclotron will accelerate.  
NOTE Confidence: 0.971175  
00:18:45.930 --> 00:18:46.910 And the protons  
NOTE Confidence: 0.9835828  
00:18:47.450 --> 00:18:48.970 also enter into the tissue,  
NOTE Confidence: 0.9835828  
00:18:48.970 --> 00:18:50.190 but they have a special  
NOTE Confidence: 0.95466405  
00:18:50.755 --> 00:18:51.734 property because  
NOTE Confidence: 0.95821244  
00:18:52.195 --> 00:18:53.635 they're a particle with mass  
NOTE Confidence: 0.95821244  
00:18:53.635 --> 00:18:55.475 that they enter tissue and  
NOTE Confidence: 0.95821244  
00:18:55.475 --> 00:18:57.234 they stop suddenly to deposit  
NOTE Confidence: 0.95821244  
00:18:57.234 --> 00:18:58.054 their dose.  
NOTE Confidence: 0.9850017

00:18:58.515 --> 00:19:00.215 And that lets us tailor the  
00:19:02.770 --> 00:19:04.869 delivery of the ionizing radiation  
NOTE Confidence: 0.87104505  
00:19:05.490 --> 00:19:06.309 even better.  
NOTE Confidence: 0.963572  
00:19:06.850 --> 00:19:07.330 And,  
NOTE Confidence: 0.97564983  
00:19:07.970 --> 00:19:09.090 we think that it has  
NOTE Confidence: 0.97564983  
00:19:09.090 --> 00:19:10.390 some advantages.  
NOTE Confidence: 0.98021406  
00:19:10.930 --> 00:19:13.270 But developing proton beam facilities  
NOTE Confidence: 0.98021406  
00:19:13.330 --> 00:19:14.609 is not a simple endeavor.  
NOTE Confidence: 0.98021406  
00:19:14.609 --> 00:19:16.369 It's much more expensive and  
NOTE Confidence: 0.98021406  
00:19:16.369 --> 00:19:17.430 involved than  
NOTE Confidence: 0.92289317  
00:19:18.305 --> 00:19:19.925 installing a regular LINAC.  
NOTE Confidence: 0.970011  
00:19:20.465 --> 00:19:22.065 And so there are not  
NOTE Confidence: 0.970011  
00:19:22.065 --> 00:19:23.125 many in the country,  
NOTE Confidence: 0.95277196  
00:19:23.905 --> 00:19:24.945 and there is  
NOTE Confidence: 0.95277196  
00:19:24.945 --> 00:19:26.385 not one in Connecticut right  
NOTE Confidence: 0.95277196  
00:19:26.385 --> 00:19:27.744 now, but Yale New Haven  
NOTE Confidence: 0.95277196

00:19:27.744 --> 00:19:29.365 Health System and Hartford HealthCare

NOTE Confidence: 0.94577837

00:19:30.080 --> 00:19:30.900 have partnered,

NOTE Confidence: 0.910775

00:19:31.600 --> 00:19:33.359 and we recently did the

NOTE Confidence: 0.910775

00:19:33.359 --> 00:19:33.859 groundbreaking to

00:19:35.600 --> 00:19:37.200 advance a new proton beam

NOTE Confidence: 0.96341705

00:19:37.200 --> 00:19:37.700 facility,

NOTE Confidence: 0.92682976

00:19:38.720 --> 00:19:39.840 in the center of the

NOTE Confidence: 0.92682976

00:19:39.840 --> 00:19:40.980 state that'll be

NOTE Confidence: 0.9991468

00:19:41.520 --> 00:19:42.720 a resource for all of

NOTE Confidence: 0.9991468

00:19:42.720 --> 00:19:43.940 the people in the region.

NOTE Confidence: 0.9986903

00:19:44.395 --> 00:19:45.915 And the price tag for

NOTE Confidence: 0.9986903

00:19:45.915 --> 00:19:47.595 these kinds of facilities is

NOTE Confidence: 0.9986903

00:19:47.595 --> 00:19:48.255 in the

NOTE Confidence: 0.98676294

00:19:48.795 --> 00:19:50.575 tens of millions of dollars.

00:19:52.155 --> 00:19:53.195 You know, this one is

NOTE Confidence: 0.99469215

00:19:53.195 --> 00:19:54.315 somewhere in the range of

NOTE Confidence: 0.99469215

00:19:54.315 --> 00:19:56.155 seventy million all in with

NOTE Confidence: 0.99469215  
00:19:56.155 --> 00:19:57.600 all the construction and  
NOTE Confidence: 0.79528487  
00:19:58.160 --> 00:19:58.660 equipment.  
00:20:00.880 --> 00:20:01.700 Can you  
NOTE Confidence: 0.99380654  
00:20:02.000 --> 00:20:03.840 talk about some of your  
NOTE Confidence: 0.99380654  
00:20:03.840 --> 00:20:04.340 research?  
NOTE Confidence: 0.99855703  
00:20:05.119 --> 00:20:05.619 And  
NOTE Confidence: 0.9985343  
00:20:06.240 --> 00:20:07.359 I know some of the  
NOTE Confidence: 0.9985343  
00:20:07.359 --> 00:20:08.980 recent research has  
NOTE Confidence: 0.99948615  
00:20:09.440 --> 00:20:10.660 related to the treatment of  
00:20:12.559 --> 00:20:13.380 what is  
NOTE Confidence: 0.9992161  
00:20:14.855 --> 00:20:16.315 often thought of as  
NOTE Confidence: 0.95844424  
00:20:16.934 --> 00:20:18.534 inherited breast cancer and other  
NOTE Confidence: 0.95844424  
00:20:18.534 --> 00:20:20.054 cancers that  
NOTE Confidence: 0.95844424  
00:20:20.054 --> 00:20:21.975 arise in the setting of  
NOTE Confidence: 0.95844424  
00:20:21.975 --> 00:20:22.875 of BRCA  
NOTE Confidence: 0.94804823  
00:20:23.494 --> 00:20:23.994 mutations.  
NOTE Confidence: 0.9986493

00:20:25.494 --> 00:20:27.174 But I know that your  
NOTE Confidence: 0.9986493

00:20:27.174 --> 00:20:28.955 research career stretches  
NOTE Confidence: 0.9702132

00:20:29.290 --> 00:20:30.830 pretty far back. And  
NOTE Confidence: 0.9843176

00:20:31.210 --> 00:20:32.010 what are some of the  
NOTE Confidence: 0.9843176

00:20:32.010 --> 00:20:33.130 things you've worked on over  
NOTE Confidence: 0.9843176

00:20:33.130 --> 00:20:34.490 the years? And then maybe  
NOTE Confidence: 0.9843176

00:20:34.490 --> 00:20:36.170 we can talk more about  
NOTE Confidence: 0.9843176

00:20:36.170 --> 00:20:36.670 BRCA.  
NOTE Confidence: 0.9108113

00:20:37.450 --> 00:20:38.650 Yes, I've  
NOTE Confidence: 0.9108113

00:20:38.650 --> 00:20:40.030 been interested in how  
NOTE Confidence: 0.98103917

00:20:41.130 --> 00:20:43.195 DNA repair pathways can influence  
NOTE Confidence: 0.98103917

00:20:43.255 --> 00:20:44.695 the development of cancer and  
NOTE Confidence: 0.98103917

00:20:44.695 --> 00:20:45.895 how they can be exploited  
NOTE Confidence: 0.98103917

00:20:45.895 --> 00:20:46.635 for treatment.  
NOTE Confidence: 0.8979699

00:20:47.095 --> 00:20:48.775 And you mentioned  
NOTE Confidence: 0.8979699

00:20:48.775 --> 00:20:49.355 the BRCA1

NOTE Confidence: 0.9433843  
00:20:49.815 --> 00:20:50.475 and BRCA2  
NOTE Confidence: 0.83154005  
00:20:52.295 --> 00:20:53.435 genes which are linked  
NOTE Confidence: 0.94758743  
00:20:55.609 --> 00:20:56.570 to a large extent to  
NOTE Confidence: 0.94758743  
00:20:56.570 --> 00:20:58.109 breast and ovarian cancers.  
NOTE Confidence: 0.94834715  
00:21:00.090 --> 00:21:01.450 And defects in those genes  
NOTE Confidence: 0.94834715  
00:21:01.450 --> 00:21:03.530 lead to a deficiency in  
NOTE Confidence: 0.94834715  
00:21:03.530 --> 00:21:05.390 a pathway of DNA repair  
NOTE Confidence: 0.9829886  
00:21:05.945 --> 00:21:07.325 called homologous recombination.  
NOTE Confidence: 0.9860671  
00:21:08.265 --> 00:21:10.425 We recently discovered that some  
NOTE Confidence: 0.9860671  
00:21:10.425 --> 00:21:12.105 other genes that are seen  
NOTE Confidence: 0.9860671  
00:21:12.105 --> 00:21:13.244 mutated in cancers  
NOTE Confidence: 0.948239  
00:21:13.865 --> 00:21:15.804 that are linked to abnormal  
NOTE Confidence: 0.948239  
00:21:15.945 --> 00:21:16.445 metabolism  
NOTE Confidence: 0.9568783  
00:21:17.705 --> 00:21:19.065 also cause a defect in  
NOTE Confidence: 0.9568783  
00:21:19.065 --> 00:21:20.765 the same DNA repair pathway  
NOTE Confidence: 0.9710043

00:21:21.880 --> 00:21:23.260 and we found unexpectedly  
NOTE Confidence: 0.9929835

00:21:23.560 --> 00:21:24.940 that they can be exploited  
NOTE Confidence: 0.9982009

00:21:25.640 --> 00:21:26.140 with  
NOTE Confidence: 0.95027804

00:21:27.160 --> 00:21:27.660 molecularly  
NOTE Confidence: 0.9974842

00:21:28.040 --> 00:21:29.580 targeted agents that  
NOTE Confidence: 0.9542711

00:21:30.680 --> 00:21:31.740 exploit related  
NOTE Confidence: 0.9573806

00:21:32.040 --> 00:21:33.340 DNA repair pathways.  
NOTE Confidence: 0.97115487

00:21:34.715 --> 00:21:36.315 And similar to the situation  
NOTE Confidence: 0.97115487

00:21:36.315 --> 00:21:37.695 with BRCA1 and BRCA2,  
NOTE Confidence: 0.9243045

00:21:38.475 --> 00:21:39.935 these genes include  
NOTE Confidence: 0.9272296

00:21:40.635 --> 00:21:42.255 genes with the names IDH1  
NOTE Confidence: 0.9272296

00:21:42.475 --> 00:21:44.494 and two, SDH and FH  
NOTE Confidence: 0.9272296

00:21:44.715 --> 00:21:45.855 and they're linked to  
NOTE Confidence: 0.9188045

00:21:46.570 --> 00:21:49.050 brain tumors, sarcomas, kidney cancers  
NOTE Confidence: 0.9188045

00:21:49.050 --> 00:21:49.710 and others.

00:21:51.130 --> 00:21:52.490 Some of the strategy that  
NOTE Confidence: 0.94190454

00:21:52.490 --> 00:21:53.770 we and others have worked  
NOTE Confidence: 0.94190454

00:21:53.770 --> 00:21:54.730 on, you can think of  
NOTE Confidence: 0.94190454

00:21:54.730 --> 00:21:56.190 it like a traffic pattern  
NOTE Confidence: 0.8667809

00:21:56.490 --> 00:21:57.369 since you and I live  
NOTE Confidence: 0.8667809

00:21:57.369 --> 00:21:58.590 in Southern Connecticut.  
NOTE Confidence: 0.9640354

00:21:59.295 --> 00:22:00.255 If there's a big  
NOTE Confidence: 0.9640354

00:22:00.255 --> 00:22:01.535 crash on I-95  
NOTE Confidence: 0.9640354

00:22:01.535 --> 00:22:02.735 and you can't get where  
NOTE Confidence: 0.9640354

00:22:02.735 --> 00:22:04.095 you're going, you might think  
NOTE Confidence: 0.9640354

00:22:04.095 --> 00:22:05.295 of going to the Merritt  
NOTE Confidence: 0.9640354

00:22:05.295 --> 00:22:05.795 Parkway,  
NOTE Confidence: 0.98119915

00:22:06.255 --> 00:22:07.615 but we're using an agent  
NOTE Confidence: 0.98119915

00:22:07.615 --> 00:22:08.975 that blocks the Merritt Parkway,  
NOTE Confidence: 0.98119915

00:22:08.975 --> 00:22:10.095 so then you have nowhere  
NOTE Confidence: 0.98119915

00:22:10.095 --> 00:22:10.755 to go.  
NOTE Confidence: 0.99011177

00:22:11.135 --> 00:22:13.055 And so, we're taking that



NOTE Confidence: 0.99011177  
00:22:13.055 --> 00:22:14.490 kind of approach for these  
NOTE Confidence: 0.99011177  
00:22:14.970 --> 00:22:16.430 genetically linked cancers.  
NOTE Confidence: 0.9977916  
00:22:17.050 --> 00:22:19.230 And this is by developing  
NOTE Confidence: 0.9977916  
00:22:19.369 --> 00:22:19.869 drugs?  
NOTE Confidence: 0.9936443  
00:22:20.410 --> 00:22:22.010 Yeah. Drugs that target other  
NOTE Confidence: 0.9936443  
00:22:22.170 --> 00:22:23.850 DNA repair pathways. So there's  
NOTE Confidence: 0.9936443  
00:22:23.850 --> 00:22:24.810 a well known class of  
NOTE Confidence: 0.9936443  
00:22:24.810 --> 00:22:26.270 drugs called PARP inhibitors.  
NOTE Confidence: 0.99677753  
00:22:26.570 --> 00:22:27.850 We did not develop them,  
NOTE Confidence: 0.99677753  
00:22:27.850 --> 00:22:29.575 but we're trying to find  
NOTE Confidence: 0.99677753  
00:22:29.575 --> 00:22:31.034 new uses for them.  
NOTE Confidence: 0.9864502  
00:22:32.294 --> 00:22:33.494 Another thing that we did  
NOTE Confidence: 0.9864502  
00:22:33.494 --> 00:22:35.414 was, we found that agents  
NOTE Confidence: 0.9864502  
00:22:35.414 --> 00:22:36.154 that inhibit  
NOTE Confidence: 0.91724485  
00:22:36.695 --> 00:22:37.195 angiogenesis,  
NOTE Confidence: 0.9469677

00:22:37.734 --> 00:22:39.975 which means the development of  
NOTE Confidence: 0.9469677

00:22:39.975 --> 00:22:40.955 new blood vessels,  
NOTE Confidence: 0.9182759

00:22:41.960 --> 00:22:43.800 these can lead to reduced  
NOTE Confidence: 0.9182759

00:22:43.800 --> 00:22:45.740 oxygen in tumors, a situation  
NOTE Confidence: 0.9182759

00:22:45.800 --> 00:22:46.780 known as hypoxia.  
NOTE Confidence: 0.9971367

00:22:47.400 --> 00:22:48.140 And that,  
NOTE Confidence: 0.93358517

00:22:48.520 --> 00:22:50.600 we found, causes decreased DNA  
NOTE Confidence: 0.93358517

00:22:50.600 --> 00:22:51.100 repair,  
NOTE Confidence: 0.9993723

00:22:51.480 --> 00:22:52.940 and we can then exploit  
NOTE Confidence: 0.9993723

00:22:53.000 --> 00:22:54.440 that situation with some of  
NOTE Confidence: 0.9993723

00:22:54.440 --> 00:22:55.720 the agents I just talked  
NOTE Confidence: 0.9993723

00:22:55.720 --> 00:22:56.220 about.  
NOTE Confidence: 0.99576795

00:22:56.715 --> 00:22:58.155 And is there a role  
NOTE Confidence: 0.99576795

00:22:58.155 --> 00:22:59.294 for using radiation  
NOTE Confidence: 0.9854145

00:22:59.595 --> 00:23:00.875 in combination with some of  
NOTE Confidence: 0.9854145

00:23:00.875 --> 00:23:02.715 these therapies?

NOTE Confidence: 0.9854145

00:23:02.715 --> 00:23:03.215 Yes, for sure.

NOTE Confidence: 0.9391286

00:23:03.755 --> 00:23:05.115 Some of these DNA repair

NOTE Confidence: 0.9391286

00:23:05.115 --> 00:23:06.655 inhibitors like PARP inhibitors,

NOTE Confidence: 0.98394394

00:23:07.674 --> 00:23:08.875 and others that are in

NOTE Confidence: 0.98394394

00:23:08.875 --> 00:23:10.395 clinical development, there's a number

NOTE Confidence: 0.98394394

00:23:10.395 --> 00:23:11.615 of targeted agents,

NOTE Confidence: 0.96295583

00:23:12.359 --> 00:23:13.559 that we and others are

NOTE Confidence: 0.96295583

00:23:13.559 --> 00:23:14.380 working on to

NOTE Confidence: 0.9942248

00:23:15.160 --> 00:23:17.400 inhibit repair pathways that are

NOTE Confidence: 0.9942248

00:23:17.400 --> 00:23:17.900 important

NOTE Confidence: 0.9926445

00:23:18.680 --> 00:23:20.119 to how the cancer cell

NOTE Confidence: 0.9926445

00:23:20.119 --> 00:23:21.260 tries to fix

NOTE Confidence: 0.979401

00:23:21.960 --> 00:23:23.320 the type of DNA damage

NOTE Confidence: 0.979401

00:23:23.320 --> 00:23:24.540 the radiation causes.

NOTE Confidence: 0.98928374

00:23:25.174 --> 00:23:26.215 And if I can just

NOTE Confidence: 0.98928374

00:23:26.215 --> 00:23:28.554 explore one other combination that's

NOTE Confidence: 0.98928374

00:23:28.615 --> 00:23:30.635 been talked about recently. So

NOTE Confidence: 0.96235055

00:23:31.095 --> 00:23:31.595 immunotherapy,

NOTE Confidence: 0.99387896

00:23:32.054 --> 00:23:33.195 of course, has become,

NOTE Confidence: 0.99207574

00:23:34.695 --> 00:23:36.315 the treatment of the past

NOTE Confidence: 0.93291515

00:23:36.615 --> 00:23:38.635 decade. It's used in

NOTE Confidence: 0.9748067

00:23:40.270 --> 00:23:41.970 well over a dozen different

NOTE Confidence: 0.9748067

00:23:42.109 --> 00:23:43.790 tumor types and can be

NOTE Confidence: 0.9748067

00:23:43.790 --> 00:23:44.690 highly effective.

NOTE Confidence: 0.99031883

00:23:45.230 --> 00:23:47.250 But there's some suggestion that

NOTE Confidence: 0.99031883

00:23:47.310 --> 00:23:49.630 radiation could also augment the

NOTE Confidence: 0.99031883

00:23:49.630 --> 00:23:50.609 effect of immunotherapy.

NOTE Confidence: 0.971093

00:23:51.915 --> 00:23:53.515 Yes. I think there's

NOTE Confidence: 0.971093

00:23:53.515 --> 00:23:55.515 a lot of intense study,

NOTE Confidence: 0.971093

00:23:55.515 --> 00:23:57.195 both basic science and in

NOTE Confidence: 0.971093

00:23:57.195 --> 00:23:58.235 the clinic, on how to

NOTE Confidence: 0.971093  
00:23:58.235 --> 00:24:00.255 best combine radiation and immunotherapy.  
NOTE Confidence: 0.9988304  
00:24:01.755 --> 00:24:02.255 Radiation can  
00:24:03.915 --> 00:24:06.315 elicit an inflamed response in  
NOTE Confidence: 0.96884054  
00:24:06.315 --> 00:24:06.815 tumors that  
NOTE Confidence: 0.9959086  
00:24:08.690 --> 00:24:09.190 synergizes  
NOTE Confidence: 0.99923784  
00:24:09.650 --> 00:24:10.770 with the type of immune  
NOTE Confidence: 0.99923784  
00:24:10.770 --> 00:24:11.750 response that  
NOTE Confidence: 0.99108344  
00:24:12.050 --> 00:24:14.050 these immune checkpoint inhibitors will  
NOTE Confidence: 0.99108344  
00:24:14.050 --> 00:24:14.550 provoke.  
NOTE Confidence: 0.97284293  
00:24:15.730 --> 00:24:17.410 It is also thought  
NOTE Confidence: 0.97284293  
00:24:17.410 --> 00:24:19.170 that radiation can cause the  
NOTE Confidence: 0.97284293  
00:24:19.170 --> 00:24:21.270 release of tumor antigens and  
NOTE Confidence: 0.97284293  
00:24:21.525 --> 00:24:22.805 sort of create an in  
NOTE Confidence: 0.97284293  
00:24:22.805 --> 00:24:24.725 situ tumor vaccine, if you  
NOTE Confidence: 0.97284293  
00:24:24.725 --> 00:24:25.225 will.  
NOTE Confidence: 0.88530135  
00:24:26.565 --> 00:24:28.805 So, you know, in general,

NOTE Confidence: 0.88530135

00:24:28.805 --> 00:24:29.765 it's thought that

NOTE Confidence: 0.998083

00:24:30.165 --> 00:24:32.425 radiation can enhance the effectiveness

NOTE Confidence: 0.998083

00:24:32.645 --> 00:24:33.465 of tumor

NOTE Confidence: 0.94097245

00:24:33.845 --> 00:24:35.780 immune therapy and vice versa,

NOTE Confidence: 0.94097245

00:24:35.840 --> 00:24:37.520 that immune therapy or immune

NOTE Confidence: 0.94097245

00:24:37.520 --> 00:24:39.440 response will enhance the effect

NOTE Confidence: 0.94097245

00:24:39.440 --> 00:24:40.100 of radiation.

NOTE Confidence: 0.99411714

00:24:41.600 --> 00:24:42.740 Have you seen a

NOTE Confidence: 0.93964255

00:24:43.119 --> 00:24:44.580 change in the

NOTE Confidence: 0.9987531

00:24:45.200 --> 00:24:45.940 type of

NOTE Confidence: 0.9990694

00:24:46.800 --> 00:24:48.740 medical student who goes into

NOTE Confidence: 0.99855477

00:24:49.534 --> 00:24:51.635 radiation oncology today versus

NOTE Confidence: 0.98111117

00:24:52.335 --> 00:24:53.875 twenty or thirty years ago?

NOTE Confidence: 0.98111117

00:24:54.015 --> 00:24:54.975 It would seem to me

NOTE Confidence: 0.98111117

00:24:54.975 --> 00:24:55.775 that a lot of these

NOTE Confidence: 0.98111117

00:24:55.775 --> 00:24:57.294 people must be people who  
NOTE Confidence: 0.98111117

00:24:57.294 --> 00:24:57.794 are  
NOTE Confidence: 0.9881319

00:24:59.215 --> 00:25:00.975 interested in physics and interested  
NOTE Confidence: 0.9881319

00:25:01.215 --> 00:25:03.054 in science and  
00:25:03.990 --> 00:25:04.730 perhaps interested  
NOTE Confidence: 0.9488303

00:25:05.030 --> 00:25:07.130 in pursuing careers in research.  
NOTE Confidence: 0.9730265

00:25:07.830 --> 00:25:08.869 Yes. I think it's always  
NOTE Confidence: 0.9730265

00:25:08.869 --> 00:25:10.090 been a research friendly  
NOTE Confidence: 0.9786202

00:25:11.670 --> 00:25:13.350 specialty because there's a lot  
NOTE Confidence: 0.9786202

00:25:13.350 --> 00:25:15.590 of basic science, and cellular  
NOTE Confidence: 0.9786202

00:25:15.590 --> 00:25:17.030 biology to explore as well  
NOTE Confidence: 0.9786202

00:25:17.030 --> 00:25:18.310 as the physics and the  
NOTE Confidence: 0.9786202

00:25:18.310 --> 00:25:19.130 more technological  
NOTE Confidence: 0.979905

00:25:20.505 --> 00:25:20.744 aspects.  
NOTE Confidence: 0.9600152

00:25:21.385 --> 00:25:22.905 I think that, you know,  
NOTE Confidence: 0.9600152

00:25:22.905 --> 00:25:24.505 years ago, it  
NOTE Confidence: 0.9600152

00:25:24.505 --> 00:25:25.865 was felt, well, maybe people  
NOTE Confidence: 0.9600152

00:25:25.865 --> 00:25:26.825 who had a little bit  
NOTE Confidence: 0.9600152

00:25:26.825 --> 00:25:28.905 more proclivity for physics might  
NOTE Confidence: 0.9600152

00:25:28.905 --> 00:25:30.345 go into the field. But  
NOTE Confidence: 0.9600152

00:25:30.345 --> 00:25:31.465 actually, I think the field  
NOTE Confidence: 0.9600152

00:25:31.465 --> 00:25:31.965 now  
NOTE Confidence: 0.8919977

00:25:32.549 --> 00:25:33.049 attracts,  
NOTE Confidence: 0.94563293

00:25:33.509 --> 00:25:35.190 people that like  
NOTE Confidence: 0.96933275

00:25:36.149 --> 00:25:37.669 advanced technology that we can  
NOTE Confidence: 0.96933275

00:25:37.669 --> 00:25:38.950 bring to bear, the image  
NOTE Confidence: 0.96933275

00:25:38.950 --> 00:25:40.090 guidance, the  
NOTE Confidence: 0.9260061

00:25:40.630 --> 00:25:42.230 treatment planning that, you know,  
NOTE Confidence: 0.9260061

00:25:42.230 --> 00:25:43.210 is very computerized and visual,  
NOTE Confidence: 0.9894832

00:25:47.045 --> 00:25:48.345 so I think it's expanded  
NOTE Confidence: 0.91041905

00:25:48.725 --> 00:25:50.325 the reach of people that  
NOTE Confidence: 0.91041905

00:25:50.325 --> 00:25:50.825 are



NOTE Confidence: 0.9566695

00:25:51.205 --> 00:25:52.484 interested in the field. And

NOTE Confidence: 0.9566695

00:25:52.484 --> 00:25:53.285 the other thing is I

NOTE Confidence: 0.9566695

00:25:53.285 --> 00:25:54.405 think people have come to

NOTE Confidence: 0.9566695

00:25:54.405 --> 00:25:55.145 know that

NOTE Confidence: 0.9719112

00:25:55.445 --> 00:25:57.065 we're a very patient oriented

NOTE Confidence: 0.9719112

00:25:57.285 --> 00:25:57.785 specialty,

NOTE Confidence: 0.9644168

00:25:58.830 --> 00:26:00.669 just like your specialty medical

NOTE Confidence: 0.9644168

00:26:00.669 --> 00:26:02.609 oncology. We're very patient facing,

NOTE Confidence: 0.99185985

00:26:03.390 --> 00:26:04.929 and, we have longitudinal

NOTE Confidence: 0.99275947

00:26:05.309 --> 00:26:06.830 relationships with our patients, and

NOTE Confidence: 0.99275947

00:26:06.830 --> 00:26:08.609 I think that that attracts

NOTE Confidence: 0.99275947

00:26:08.669 --> 00:26:10.289 the medical students as well.

NOTE Confidence: 0.8369769

00:26:10.605 --> 00:26:12.045 Longitude and relationships with your

NOTE Confidence: 0.8369769

00:26:12.045 --> 00:26:13.085 patients

NOTE Confidence: 0.9728048

00:26:13.565 --> 00:26:15.505 and, of course, close relationships

NOTE Confidence: 0.9728048

00:26:15.645 --> 00:26:17.105 with your colleagues since  
NOTE Confidence: 0.980567

00:26:17.965 --> 00:26:19.165 in the care of patients  
NOTE Confidence: 0.980567

00:26:19.165 --> 00:26:20.445 with cancer we  
NOTE Confidence: 0.98770946

00:26:22.205 --> 00:26:24.125 all work together since it  
NOTE Confidence: 0.98770946

00:26:24.125 --> 00:26:24.625 takes  
NOTE Confidence: 0.99368507

00:26:25.220 --> 00:26:26.740 far more than any one  
NOTE Confidence: 0.99368507

00:26:26.740 --> 00:26:27.240 discipline.  
NOTE Confidence: 0.9465303

00:26:28.420 --> 00:26:29.560 And as we  
NOTE Confidence: 0.99882066

00:26:30.420 --> 00:26:31.160 wrap up,  
NOTE Confidence: 0.9998301

00:26:31.540 --> 00:26:32.280 can you  
NOTE Confidence: 0.99921

00:26:33.060 --> 00:26:35.400 speculate about where radiation  
NOTE Confidence: 0.9994464

00:26:35.780 --> 00:26:36.280 oncology  
NOTE Confidence: 0.999265

00:26:36.580 --> 00:26:38.420 is going over the course  
NOTE Confidence: 0.999265

00:26:38.420 --> 00:26:39.320 of the next  
NOTE Confidence: 0.9489286

00:26:39.635 --> 00:26:41.015 ten or twenty years?  
00:26:42.595 --> 00:26:44.135 What should we be looking for?  
NOTE Confidence: 0.97161585

00:26:44.355 --> 00:26:45.315 Well, I think that we're  
NOTE Confidence: 0.97161585

00:26:45.315 --> 00:26:46.595 gonna see a greater  
NOTE Confidence: 0.97161585

00:26:46.595 --> 00:26:47.575 ability to  
NOTE Confidence: 0.9937108

00:26:48.035 --> 00:26:49.715 achieve real time adjustments in  
NOTE Confidence: 0.9937108

00:26:49.715 --> 00:26:50.375 the treatment,  
NOTE Confidence: 0.98063123

00:26:50.994 --> 00:26:52.355 using some of these onboard  
NOTE Confidence: 0.98063123

00:26:52.355 --> 00:26:54.535 imaging technologies. And as the  
NOTE Confidence: 0.9977882

00:26:55.280 --> 00:26:55.780 software  
NOTE Confidence: 0.99854094

00:26:56.480 --> 00:26:57.700 and hardware improves  
NOTE Confidence: 0.9644815

00:26:58.240 --> 00:26:59.919 and we can incorporate things  
NOTE Confidence: 0.9644815

00:26:59.919 --> 00:27:02.419 like artificial intelligence to identify  
NOTE Confidence: 0.94083

00:27:02.880 --> 00:27:04.480 the tumor targets, track how  
NOTE Confidence: 0.94083

00:27:04.480 --> 00:27:06.580 they move and adjust radiation  
NOTE Confidence: 0.94083

00:27:06.640 --> 00:27:07.140 treatments.  
NOTE Confidence: 0.93038464

00:27:07.815 --> 00:27:09.255 That's going to allow even  
NOTE Confidence: 0.93038464

00:27:09.255 --> 00:27:10.075 more precise

NOTE Confidence: 0.9921966  
00:27:10.375 --> 00:27:11.034 and tailored  
NOTE Confidence: 0.9928529  
00:27:11.734 --> 00:27:13.434 radiation therapy for patients.  
NOTE Confidence: 0.95482516  
00:27:13.815 --> 00:27:14.855 I think also we're going  
NOTE Confidence: 0.95482516  
00:27:14.855 --> 00:27:15.914 to see more individualized  
NOTE Confidence: 0.9754847  
00:27:16.215 --> 00:27:17.895 patient treatments based on clinical  
NOTE Confidence: 0.9754847  
00:27:17.895 --> 00:27:19.195 and genetic characteristics  
NOTE Confidence: 0.9787068  
00:27:20.250 --> 00:27:22.010 And, like we were alluding  
NOTE Confidence: 0.9787068  
00:27:22.010 --> 00:27:22.670 to before,  
NOTE Confidence: 0.9512168  
00:27:23.290 --> 00:27:24.330 I see the next five  
NOTE Confidence: 0.9512168  
00:27:24.330 --> 00:27:25.150 or ten years,  
NOTE Confidence: 0.99292415  
00:27:25.850 --> 00:27:26.970 that we will be able  
NOTE Confidence: 0.99292415  
00:27:26.970 --> 00:27:28.830 to deploy new targeted biological  
NOTE Confidence: 0.99292415  
00:27:29.050 --> 00:27:30.890 agents that sensitize tumors to  
NOTE Confidence: 0.99292415  
00:27:30.890 --> 00:27:31.390 radiation  
NOTE Confidence: 0.98008096  
00:27:32.425 --> 00:27:32.925 without  
NOTE Confidence: 0.9312142

00:27:33.545 --> 00:27:35.565 sensitizing healthy tissues. And,  
NOTE Confidence: 0.9805732

00:27:36.105 --> 00:27:37.465 for example, we're  
NOTE Confidence: 0.9805732

00:27:37.465 --> 00:27:38.425 working in the lab to  
NOTE Confidence: 0.9805732

00:27:38.425 --> 00:27:39.865 develop a class of peptide  
NOTE Confidence: 0.9805732

00:27:39.865 --> 00:27:41.785 drug conjugates that does just  
NOTE Confidence: 0.9805732

00:27:41.785 --> 00:27:42.285 that.  
NOTE Confidence: 0.95783776

00:27:43.225 --> 00:27:44.905 And the preclinical models look  
NOTE Confidence: 0.95783776

00:27:44.905 --> 00:27:46.845 encouraging, so hopefully that will  
NOTE Confidence: 0.9908915

00:27:47.179 --> 00:27:48.380 eventually make its way to  
NOTE Confidence: 0.9908915

00:27:48.380 --> 00:27:50.140 the clinic.  
NOTE Confidence: 0.9908915

00:27:50.140 --> 00:27:51.020 And not to set up a  
NOTE Confidence: 0.9908915

00:27:51.020 --> 00:27:52.700 competition with surgery, but do  
NOTE Confidence: 0.9908915

00:27:52.700 --> 00:27:53.760 you think these changes  
NOTE Confidence: 0.9995857

00:27:54.299 --> 00:27:56.400 will lead to fewer surgical  
NOTE Confidence: 0.9995857

00:27:56.460 --> 00:27:56.960 procedures  
NOTE Confidence: 0.9960714

00:27:57.260 --> 00:27:58.400 and more radiation?

NOTE Confidence: 0.9936075

00:27:59.065 --> 00:28:00.265 Well, I think it

NOTE Confidence: 0.9936075

00:28:00.265 --> 00:28:02.105 may change the balance for

NOTE Confidence: 0.9936075

00:28:02.105 --> 00:28:03.865 certain tumors. I think I've

NOTE Confidence: 0.9936075

00:28:03.865 --> 00:28:05.625 seen that the pendulum has

NOTE Confidence: 0.9936075

00:28:05.625 --> 00:28:06.765 swung back and forth,

NOTE Confidence: 0.9587783

00:28:08.345 --> 00:28:10.345 for different, types of tumors

NOTE Confidence: 0.9587783

00:28:10.345 --> 00:28:10.665 where,

NOTE Confidence: 0.8899609

00:28:11.790 --> 00:28:13.250 you know, radiation approaches,

NOTE Confidence: 0.96538514

00:28:14.350 --> 00:28:15.630 are more favored and then

NOTE Confidence: 0.96538514

00:28:15.630 --> 00:28:17.070 surgical. It really

NOTE Confidence: 0.96538514

00:28:17.070 --> 00:28:18.450 depends. I mean, the surgeons

NOTE Confidence: 0.98142624

00:28:18.910 --> 00:28:19.869 have been very good to

NOTE Confidence: 0.98142624

00:28:19.869 --> 00:28:21.869 advance their technology to robotic

NOTE Confidence: 0.98142624

00:28:21.869 --> 00:28:24.190 surgeries and minimally invasive surgeries.

NOTE Confidence: 0.98142624

00:28:24.190 --> 00:28:25.230 So I think it's all

NOTE Confidence: 0.98142624

00:28:25.230 --> 00:28:26.030 to the good for the  
NOTE Confidence: 0.98142624

00:28:26.030 --> 00:28:27.794 patients, and we'll just have  
NOTE Confidence: 0.98142624

00:28:27.794 --> 00:28:29.794 more choices for figuring out  
NOTE Confidence: 0.98142624

00:28:29.794 --> 00:28:30.695 the best treatments.  
NOTE Confidence: 0.95241964

00:28:31.315 --> 00:28:32.674 Doctor Peter Glazer is the  
NOTE Confidence: 0.95241964

00:28:32.674 --> 00:28:34.195 Robert E Hunter Professor of  
NOTE Confidence: 0.95241964

00:28:34.195 --> 00:28:36.355 Therapeutic Radiology and Professor of  
NOTE Confidence: 0.95241964

00:28:36.355 --> 00:28:37.955 Genetics and Chair of the  
NOTE Confidence: 0.95241964

00:28:37.955 --> 00:28:39.875 Department of Therapeutic Radiology at  
NOTE Confidence: 0.95241964

00:28:39.875 --> 00:28:41.255 the Yale School of Medicine.  
NOTE Confidence: 0.99032795

00:28:41.730 --> 00:28:43.010 If you have questions, the  
NOTE Confidence: 0.99032795

00:28:43.010 --> 00:28:43.990 address is canceranswers  
NOTE Confidence: 0.945039

00:28:44.370 --> 00:28:46.050 at yale dot edu, and  
NOTE Confidence: 0.945039

00:28:46.050 --> 00:28:47.410 past editions of the program  
NOTE Confidence: 0.945039

00:28:47.410 --> 00:28:48.929 are available in audio and  
NOTE Confidence: 0.945039

00:28:48.929 --> 00:28:50.150 written form at yalecancercenter

NOTE Confidence: 0.99962664

00:28:50.690 --> 00:28:52.210 dot org. We hope you'll

NOTE Confidence: 0.99962664

00:28:52.210 --> 00:28:53.170 join us next time to

NOTE Confidence: 0.99962664

00:28:53.170 --> 00:28:54.130 learn more about the fight

NOTE Confidence: 0.99962664

00:28:54.130 --> 00:28:54.950 against cancer.

NOTE Confidence: 0.97473866

00:28:55.405 --> 00:28:57.085 Funding for Yale Cancer Answers

NOTE Confidence: 0.97473866

00:28:57.085 --> 00:28:58.685 is provided by Smilow Cancer

NOTE Confidence: 0.97473866

00:28:58.685 --> 00:28:59.185 Hospital.