

Conventional Radiation Therapy: Historical Development

	Year	Process/Events	Specification	Comment	
X-Ray Radiotherapy	1895	Discovery of X-ray by Roentgen. Gas filled x-ray tubes	50 kV	Since the discovery of X-ray it was realized that it can be used for both diagnostic and therapeutic purposes.	Superseded
	1913	Present day x-ray techniques using vacuum tube with a hot tungsten cathode by W. D. Coolidge	Peak voltage of 140 kV with 5 mA current	X-rays generated by these tubes were fairly soft and hence disadvantageous, since, maximum dose would be delivered at the skin and rapidly fall off with depth in tissue. <i>So there was a continuous search for more penetrating radiation right from the beginning of radiation therapy. The early attention was focused on gamma emitting radionuclides.</i>	Superseded
	1937	X-ray tubes	400 kV, 5 mA 200 kV, 30 mA		
Gamma Ray Radiotherapy	1910	Radium needle	Radium-226 0.24 – 2.2 MeV gamma rays	The first device using harder radiation was radium cannon developed by Koenig for the treatment of pelvic cancer.	
	1951	Cobalt sources	Co-60 1.17-1.33 MeV gamma rays	Better depth-dose curve, maximum dose at about 5 mm below the skin surface, thus markedly decreasing the skin dose. <i>Very soon it was accepted that future developments in radiotherapy would involve megavoltage therapy.</i>	
X-Ray Radiotherapy Electron Radio therapy	Early 1930's	Van de Graff Accelerator	Several MV accelerator	1937: The first machine (1 MeV air insulated), used in radiotherapy, was installed in Boston. 1940: The second one (1.25 MeV pressure insulated) was installed at the Massachusetts General Hospital also in Boston. 1946: High Voltage Engineering Corporation, founded by R. Van de Graff, began commercial production of 2-2.5 MeV machines. Total 40 such accelerators were built, until their production was discontinued in 1959.	Superseded
	1943	Betatron by D.W. Kerst	20-25 MeV	Dramatic increase in photon radiation energy 1949: The first patient was irradiated with x-rays generated by 20 MeV electrons from Kerst betatron in Urbana, USA. Several companies, like Allis-Chalmers in USA, Brown-Boveri, Siemens in Europe, started commercial production of 20-25 MeV betatrons for radiotherapy. <i>In the early 1970's about 200 betatrons were in medical use the worlds over. Betatrons produced x-rays with better properties, such as, higher depth dose and less side scatter.</i>	Superseded
	1953	Liner Accelerator	4-25 MeV	In mid 1960's, the rf linear accelerators rapidly took up the dominant position in the world market of medical accelerators. Due to its high dose rate (200-500 rad/min), large field (40 x 40) cm ² and provision to rotate 360° around the patient, rf linear accelerator replaced the betatron from the medical market.	Still used

Non-Conventional Radiation Therapies

	Year	Process/Events	Specification	Comment	