AbstractID:9648T itle:Optim alne edlinga ndse edimpla ntpatternsin pro statebrach ytherapyfor multichannelroboti csyst em

Purpose: It is importa nt to find optimal needl ing and s eed delivery patterns that are commonly practiced in the clinics, fo r developing a mult ichannel robotic bra chytherapy sys tem. In this s tudy, differe nt tec hniques a nd type s of ne edling a nd seed implant patternshavebe eni nvestigatedand a robotics ystemhas been designed.

Materials andM ethods: A total of 135 prostate cancer patient cases of perman entseed im planthaveb eeninve stigatedinthis study. Th ese c asesar e from t hree differ ent universi ty hos pitalswherethetypes o f se eds (radio-isotope, activity,constr uction), needles, surgical techniques,c liniciansandpatientpopulation aredifferent. Randomly selected9 5 patientsfromhospit al-1were treated with Pd -103 isot ope (2.02m Ci/seed, fre e/loose configuration, automatic genetic a lgorithm optimization-PIPER); 20 patients from hospital -2 were trea ted with I -125 isotope (0.64±0.06mCi/seed, lin ked seed, ma nual optimization, Varian-VariSeed-v7.1),and the remaining 20cases f romhospital -3 wer e t reated wit h I -125isoto pe(0.4 1mCi/seed,pre -loadednee dle, manual optimization, Varian-VariSeed-v7.1). N eedle and s eed dis tributions were statist ically a nalyzed to determine o ptimal needleconfiguration s.

Results: Hospital-1 (n=95) : pr ostate volume= 32.4 ±12.3cc (range= 15.1-59.8cc), needles= 23.4±4.6 (ra nge=11-40), seeds= 82.2±21.3(range=26-164).Hospita l-2(n=20) :pros tatevolu me=36.5±14.6 cc(range=18.2-60.1cc), needles=1 4.9±2.5(range= 10-18), seeds= 51.1±10.8 (ra nge=35-68). Hospital -3 (n=20) : prostate volu me= 3 0.9±8.2cc (20.3-51.5), needles= 13.6± 2.6 (range=10-22), seeds= 75.7±14.8(ra nge=56-115). Ther elationshipsbetweennumb ero fse edsan dnu mber ofne edlesappe ared to bemore linearfo r caseswi thPd -103(fr ees eeds) andI -125(linkedseed s),while moresc atteredd istribution wasfo und forI -125 with pre -loaded needle s. However, in all cases needles were m ore or les s periphe rally distribu ted to avo id excessive dose to urethra.

Conclusions: Resultsre vealedtha t16orles snumberofneedle sarrangedma inly peripherallyca nbe su fficienttocovermosto f the p rostate seed i mplant c ases with I-125 s eeds; c ases with Pd -103 may requ ire mo re needles. This information has b een translated fordesi gninga m ultichannelroboticsys tem.

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