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The Best of Both Worlds: Taking Advantage of Brachytherapy and External Beam Radiotherapy.

Introduction. Brachytherapy and external beam radiation represent opposite ends of the inverse square dose fall off spectrum. Brachytherapy is well suited for the delivery of conformal localized high dose radiation. While external beam radiation is well suited for conformal local and regional treatment, it is able to treat larger volumes in comparison to brachytherapy. This paradigm fits well with the natural history of many malignancies to provide maximal tumor control probability while minimizing normal tissue complications.

Methods and Materials. Two examples of combining brachytherapy and external beam radiation which illustrate the brachytherapy/external beam radiation therapy paradigm will be presented: The combination of high dose rate (HDR) brachytherapy and intensity modulated radiation (IMRT) for the definitive management of localized prostate cancer, and the use of a Yttrium 90 dural plaque in conjunction with image guided IMRT for vertebral body chordomas with significant epidural disease.

Results: HDR prostate brachytherapy and IMRT provides a very high level of disease control with only minor toxicity for patients with localized prostate cancer. This is likely due to careful treatment planning to minimize dose to critical structures such as the rectum and urethra while delivering a very high biologic effective dose to tumor bearing tissue. Similarly, Yttrium 90 dural plaques are able to deliver a very high dose of radiation to the dural surface, while underlying spinal cord will receive less than 5% of the prescribed dose. This will allow for a extremely high dose of radiation to be given to the planning target volume and increase the tumor control probability.

Conclusions: Both brachytherapy and IMRT have inherent physical advantages that can be utilized to improve the therapeutic ratio of radiation therapy. Particularly in the management of tumors where a dose-control relationship exists situated near dose sensitive structures, this paradigm is especially important.