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CASE STUDY

RECURRENT OVARIAN CARCINOMA

North Florida Regional CyberKnife® Team:

Radiation Oncologists:	Mark Perman, M.D. Cherylle A. Hayes, M.D.
Gynecologist:	Kelli C. Ross, M.D.
Chief Medical Physicist:	Donald Dubois, Ph.D.
Medical Physicist:	Howard Salmon, Ph.D.
Medical Dosimetrist:	Eric Larsen, CMD, RTT
CyberKnife Therapists:	Jeanne Wilson, RTT Scott McGee, RTT
Director of North Florida Radiation Oncology Center:	Gail Suarez, MSHSA, RT(R)(T)
CyberKnife Center:	North Florida Regional Medical Center Gainesville, FL

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DEMOGRAPHICS	
Sex:	Female
Age:	60 years
Histology:	Poorly differentiated serous papillary ovarian carcinoma

CLINICAL HISTORY	
Referred by:	Gynecologist
Past Medical History:	Stage IV ovarian carcinoma

Case History

A 60-year-old female with a history of Stage IV ovarian carcinoma presented with rising CA-125 levels (21.1 U/ml to 34.4 U/ml), signifying a probable ovarian carcinoma recurrence. Subsequent MRI showed a 2.8 x 2.5 cm nodule in the region of the left upper vaginal cuff which was confirmed by bimanual examination.

Initial diagnosis of Stage IV ovarian carcinoma was made six years earlier when the patient presented with right-sided pleural effusion and CA-125 of 1482 U/ml. An exploratory laparotomy was done and an omental cake, peritoneal studding and a nodule adjacent to the rectosigmoid were resected. Pathology showed poorly differentiated serous papillary ovarian carcinoma. Over the next four years the patient underwent multiple rounds of chemotherapy as well as stem cell transplant and additional surgical resection in the effort to control her disease. The patient's latest chemotherapy was prematurely discontinued when she experienced a severe anaphylactoid reaction. At that time the decision was made to follow her closely with imaging and CA-125 measurements.

CyberKnife® Treatment Rationale

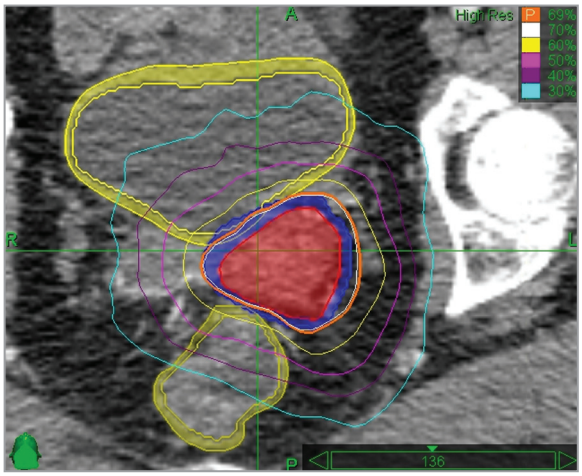
Epithelial ovarian cancer is the leading cause of death among women with gynecologic malignancies and is the fifth most common cancer in women in the US. More than 70% of women with epithelial ovarian cancer have Stage III or IV disease at the time of diagnosis.[1] Adjuvant chemotherapy is recommended for all patients with advanced stage ovarian cancer after appropriate surgery. However, more than 70% of patients relapse, with a median time to progression of less than 2 years.[2] Secondary surgery for recurrent patients has not significantly improved survival. Radiation therapy has improved survival in a subset of patients with chemotherapy-refractory disease, particularly those patients with minimal residual or relapsed disease to the pelvis, and has provided good palliation in patients with local abdominopelvic symptoms.[3] This patient presented with a recurrent ovarian cancer in the left vaginal cuff. Due to the patient's medical history, she was not a candidate for further chemotherapy or surgery. Nevertheless, the left vaginal cuff recurrence was and had always been the only site of recurrence in this patient, therefore aggressive definitive care was indicated. High dose rate brachytherapy was considered, but was declined due to its invasive nature and associated risks. External beam radiation was considered an inferior option due to the inability to limit the dose to adjacent critical structures with increased risks of bladder, vaginal and rectal toxicities. The use of stereotactic body radiotherapy as an alternative to brachytherapy for gynecologic tumors has been reported to achieve excellent local control rates with minimal toxicities.[4] The CyberKnife® Radiosurgery System offered a minimally invasive method for delivering hypofractionated radiation to the left vaginal cuff of a patient who had failed two surgical resections and numerous cycles of chemotherapy.

TREATMENT DETAILS

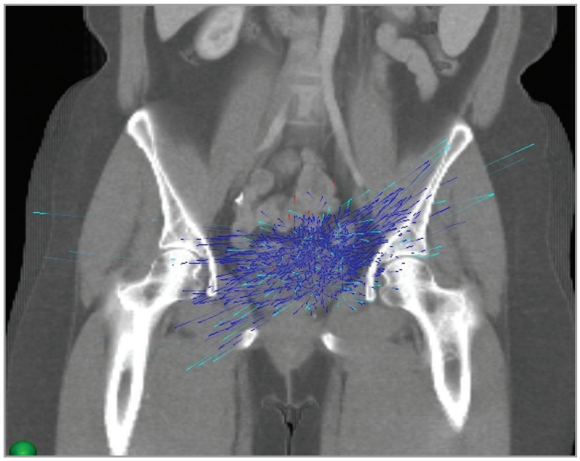
Treatment Volume:	42.53 cc	**Number of Nodes:**	140
Imaging Technique(s):	CT	**Conformality Index:**	1.25
Rx Dose & Isodose:	30 Gy to 69%	**Tracking Method:**	Fiducial
Dose and Fractions:	10 Gy x 3 fractions	**Collimator(s):**	35 mm
Number of Beams:	114	**Tumor Coverage:**	94.9%
Number of Fiducials:	4		

Planning Process

The patient was prepared for treatment planning by implanting four fiducials into the periphery of the tumor by the gynecologist. A planning CT scan was obtained 7 days later. The fiducials were identified and the lesion was outlined on the scans. The GTV was defined as the tumor and the PTV was defined as the GTV plus a 3-mm expansion resulting in a treatment volume of 42.53 cc. The final plan was created to deliver 30 Gy in 3 fractions to the 69% isodose line. The patient began treatment 6 days after the planning CT images were taken.



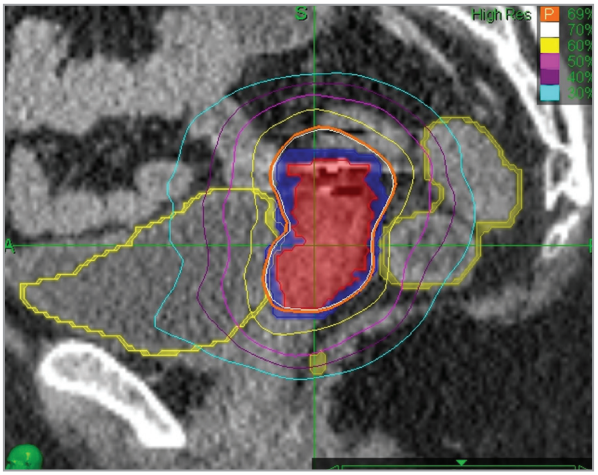
Axial treatment plan showing isodose curves to the tumor while sparing the rectum and bladder (outlined in yellow). The orange line indicates the prescription dose to the 69% isodose line providing 94.9% coverage of the PTV.



3D image of the bony anatomy and CyberKnife beam positions delivered to the left vaginal cuff.

Treatment Delivery

The patient received 30 Gy delivered in three fractions over four days. The treatment was delivered to a volume of 42.53 cc using 114 beams and a 35-mm collimator. The 69% isodose line provided 94.9% coverage of the PTV, with a conformality index of 1.25. The maximum rectal dose was 30.33 Gy. Less than 0.22 cc of the rectum received greater than 28.8 Gy, meeting the rectal constraint of less than 1 cc of the rectum receiving that dose. The maximum bladder dose was 31.8 Gy with less than 0.47 cc of the bladder receiving greater than 30 Gy. The bladder constraint of less than 10 cc of the bladder receiving greater than 30 Gy was easily met.

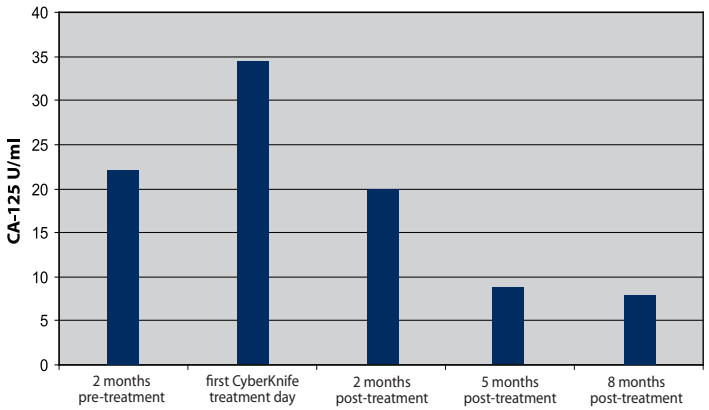


Sagittal view of the treatment plan showing isodose curves to the tumor while sparing the rectum and bladder (outlined in yellow). The orange line indicates the prescription dose to the 69% isodose line.

Outcome and Follow-Up

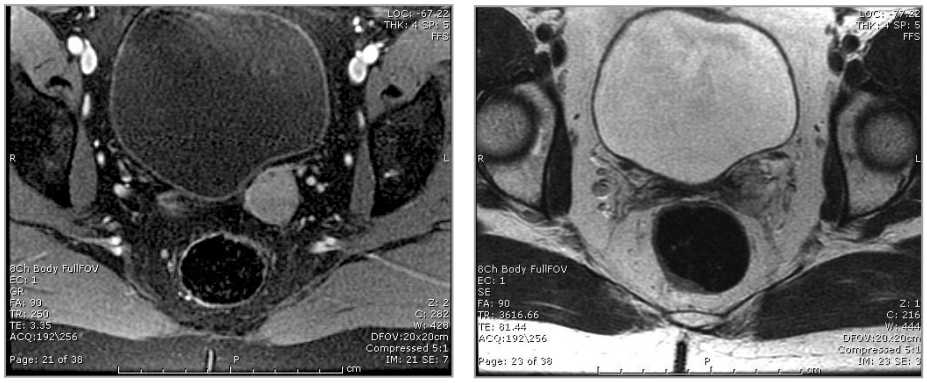
- One month following the CyberKnife® treatment a CT scan demonstrated a decrease in size of the left vaginal cuff lesion, which measured 1.86 cm x 2.14 cm
- Eight months after the CyberKnife treatment the mass could not be seen and only minimal fullness in the left vaginal wall could be detected on CT imaging
- The patient experienced minimal toxicities following CyberKnife treatment, which included occasional loose stools and mild vaginal discharge that resolved six weeks post-treatment without medications, as well as mild urinary urgency and fatigue which completely resolved by five months post-treatment without medications
- Eight months after CyberKnife treatment, CA-125 levels decreased to 7.9 U/ml

CA-125 levels obtained prior to and following CyberKnife treatment

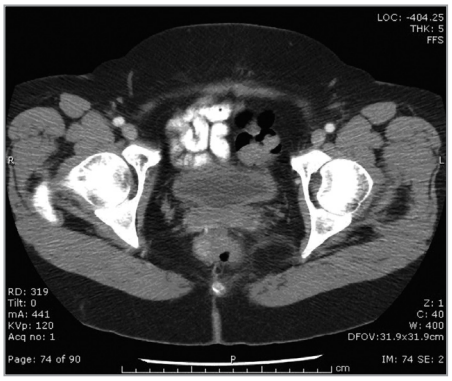


Conclusion and CyberKnife Advantages

- This patient had an excellent initial outcome with the CyberKnife System for the treatment of a recurrent ovarian carcinoma located at the vaginal cuff
- The CyberKnife System provided a convenient and minimally invasive treatment option for this patient with recurrent ovarian carcinoma who had failed previous surgery and chemotherapy
- A benefit of the CyberKnife System's capacity to target lesions accurately is the potential for low toxicity to nearby critical organs such as the bladder, rectum, urethra and vagina



T1 and T2 MRI of 28 mm x 25 mm recurrent ovarian mass located at the left vaginal cuff prior to CyberKnife treatment.



CT image demonstrating no evidence of the left vaginal cuff mass or recurrence 8 months after CyberKnife treatment.

NORTH FLORIDA REGIONAL MEDICAL CENTER

The CyberKnife Center at North Florida Radiation Oncology opened its doors on August 1, 2006 and treated more than 170 patients in its first year. The cases consist of 71% extracranial, 23% intracranial and 6% spinal treatments. HCA and North Florida Regional Medical Center, a 325-bed community hospital, are working together to develop a comprehensive cancer community oncology program to provide patients with quality care supported by state of the art technologies such as the CyberKnife.

Contact the CyberKnife Center at North Florida Radiation Oncology at 1-800-621-0575 or 352-333-5643.

References

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