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PHYSICS INVESTIGATION

Analysis of intrafraction motion in CyberKnife-based stereotaxy using mask based immobilization and 6D-skull tracking†

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Purpose: Analysis of intrafraction motion in patients with intracranial targets treated with frameless, mask based stereotactic radiosurgery / radiotherapy using standard couch and 6D-skull tracking on CyberKnife.

Materials and methods: Twenty-seven treatment datasets of fifteen patients were analyzed. For each sequential pair of images, the correction to the target position (position "offset") in six-degrees of motion was obtained. These offsets were used to calculate intrafraction shifts, and their statistical distribution. PTV margins were calculated, based on Van Herk formula.

Results: The mean ± 1 SD intrafraction translationals were 0.27±0.61mm in left-right, 0.24±0.62mm in antero-posterior and 0.14±0.24mm in supero-inferior direction, and rotations were 0.13±0.21 degrees roll, 0.18±0.25 degrees pitch and 0.28±0.44 degrees yaw. Most intrafraction shifts were ≤ 1mm and 1 degree. Fourteen instances of intrafraction shifts exceeding the robotic correction threshold were noted. Calculated PTV margins were 1mm, 1mm and 0.4mm for for left-right, antero-posterior and supero-inferior directions, respectively.

Conclusions: CyberKnife 6D-skull tracking with 1mm PTV margin effectively compensates for intrafraction motion. The occasional large intrafraction movements may assume significance for techniques not employing intrafraction motion management.

Keywords: CyberKnife, 6-D skull tracking, intrafraction motion

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Recurrent glioblastoma: a single-institution experience with reirradiation and temozolomide

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Original Research
First Online: 22 April 2017

Abstract

Background

Glioblastoma is an aggressive disease with poor prognosis. Outcomes following recurrences are dismal despite the use of multimodality treatment. Surgery is usually not a viable option, and even in those who do undergo surgery, adjuvant radiation therapy with or without concurrent chemotherapy may be viable options depending on several factors such as performance status, disease volume, and time since prior therapy. We intended to assess the efficacy of high precision reirradiation with temozolomide as a salvage modality in patients with recurrent glioblastoma.

Methods

Twenty-five patients with recurrent glioblastoma who received reirradiation (with or without concurrent temozolomide) for recurrence at our department between 2010 and 2015 were included in this retrospective analysis. Treatment decisions are taken following recommendations of multidisciplinary tumor board. Treatment details were noted from respective case records. Survival time was calculated using Kaplan-Meier method. Univariate and multivariate analyses were performed using Cox regression analysis.

Results

Eighteen men and seven women with a mean age of 52 years (range, 20–65 years) received reirradiation during the given period. Median Karnofsky Performance Score (KPS) was 70% (range, 40–90). Twelve patients underwent surgery before reirradiation, while 13 patients were deemed inoperable and direct taken for reirradiation. The reirradiation methods included stereotactic radiosurgery (2), hypofractionated stereotactic radiation therapy (15–40 Gy in 3–5 fractions; 14 patients), or conventionally fractionated stereotactic radiation therapy (45–54 Gy in 25–27 fractions; 9 patients). Patients who received conventional fractionated radiation also received concurrent temozolomide at 75 mg/m^2. All patients completed the planned course of radiation therapy and also received adjuvant temozolomide. MGMT methylation status was available for 15 patients; 7 had MGMT methylated while 8 had non-methylated tumors.

Median follow-up from recurrence was 12 months (range, 1–47.8 months). Median overall survival (OS) from recurrence was 15.2 months (95% confidence interval [CI], 10–20.33 months). None of the factors analyzed (age, sex, gross tumor volume at time of recurrence, KPS, MGMT, time of recurrence) were significant for outcomes. No grade 3 or above acute or late complications were noted following reirradiation.

Conclusions

Our results suggest that reirradiation with high precision radiotherapy along with temozolomide is an effective option in patients with recurrent glioblastoma.

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PICTORIAL REVIEW

Simple diagrammatic method to delineate male urethra in prostate cancer radiotherapy: an MRI based approach

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ABSTRACT

Stereotactic body radiotherapy (SBRT) is being increasingly utilized in the treatment of prostate cancer. With the advent of high-precision radiosurgery systems, it is possible to obtain dose distributions akin to high-dose rate brachytherapy with SBRT. However, urethral toxicity has a significant impact on the quality of life in patients with prostate cancer. Contouring the male urethra on a CT scan is difficult in the absence of an indwelling catheter. In this pictorial essay, we have used the MRI obtained for radiotherapy planning to aid in the delineation of the male urethra and have attempted to define guidelines for the same.

INTRODUCTION

The male urethra is approximately 17.5–20-cm long and extends from the bladder to the external urethral meatus. It is divided into posterior and anterior portions. The posterior urethra extends from the distal portion of bladder neck to the inferior urogenital diaphragm, and the anterior urethra extends from there to the external meatus distally. The posterior urethra consists of a prostatic segment and a membranous segment.[1]

Although there are isolated reports emphasizing the value of delineating the urethra as a volume at risk with the possibility of improving genitourinary (GU) toxicity, a large variation exists regarding the use of urethral sparing in practice, as no concrete contouring guideline is available.

The purpose of this pictorial essay was to use T_2 weighted MRI, which is most commonly used for radiotherapy planning, to aid the radiation oncologist in delineating the male urethra.

METHODS AND MATERIALS

A representative MR image set for a normal scan of the pelvis was selected for the purpose of delineation. Scan parameters included an Intravenous gadolinium-enhanced MRI Scan on a 3.0T Siemens MRI scanner, axial plane images with continuous slices of thickness 1.5 mm and a T_2 echo sequence (repetition time 14 s, echo time 7 s), with the upper limit at S1 vertebra and lower limit at mid-thigh. The contours were defined with the help of a radiologist specializing in the urogenital system. The urethra appears more hyperintense on MRI T_2 sequences than on T_1 sequences or on the radiotherapy planning CT scan. This is one of the easiest and most reproducible ways to delineate the membranous urethra. Delineation is performed on the axial sections with the aid of the sagittal and coronal sections.

We also tried contouring the urethra on a representative pelvic CT scan with a Foley's catheter *in situ*. The parameters for this CT scan were: Siemens Biograph Simulator with 3-mm sections with Omnipaque i.v. contrast and Foley's catheter F-16, with scan limits at S1 vertebra superiorly and mid-thigh inferiorly. Delineation was performed on the axial sections with the aid of the sagittal and coronal sections.

We used the contouring tools of the CMS Monaco® treatment planning system v. 3 (Elekta, Stockholm, Sweden).

RESULTS

A step-by-step guide to delineate the male urethra

Step 1: identify the bladder neck and the prostate

To begin, identify the MRI slice where the bladder neck starts. On T_2 axial MRI slices, the prostatic urethra is seen as a moderately hyperintense region in the central to the posterior portion of the prostate, surrounded by the gland

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Is wheat germ grass detrimental during radiotherapy?: a hypothesis

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Abstract

Background Antioxidant therapies to control oxidative damage have already attracted worldwide attention in recent years. Extensive studies on phytochemicals in cell culture system and animal models have provided a wealth of information on the mechanism by which such nutraceuticals show their beneficial effect. Nutraceuticals include plant-derived factors (phytochemicals) and factors derived from animal sources as well as from microbial sources. The activities of nutraceuticals are broad and include antioxidation, modulation of enzyme activity and modification of natural hormonal activity (agonist or antagonist) to act as a precursor for one or more beneficial molecules. Antioxidants scavenge free radicals that cause cell damage. Antioxidant consumption during radiotherapy and its effects are still controversial. Some studies suggest that antioxidant supplementation during chemotherapy or radiotherapy may be beneficial and some, harmful. Wheat grass is rich in superoxide dismutase, an antioxidant enzyme. Radiotherapy causes tumour cell kill via activation of reactive oxygen species, specifically by the hydroxyl radical and needs the reactive species for effective tumour control. Wheat grass which is rich in free radical scavengers can interfere with reactive oxygen species generated by radiation for tumour cell kill and can be detrimental to the therapy per se.

Purpose To hypothesise if the antioxidant properties of wheat grass could influence tumour activity, the effects of radiation therapy on tumour cells can be nullified when wheat grass is taken during radiotherapy.

https://www.cambridge.org/core/journals/journal-of-radiotherapy-in-practice/article/is-wheat-germ-grass-detrimental-during-radiotherapy-a-hypothesis/7F2D65A37581C88C339DF2EBA70171DF

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FULL PAPER

Clinical outcomes of adaptive radiotherapy in head and neck cancers

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Objective: The present study evaluated the efficacy and toxicity of adaptive radiotherapy (RT) among patients with head and neck cancer.
Methods: 36 patients eligible for radical RT underwent RT planning scans and were planned for 54-Gy dose to both high-risk and low-risk target volumes in Phase I. All patients underwent a second (adaptive) scan during the fifth week of RT. Phase II plans for 16 Gy to high-risk planning target volume were developed on these mid-treatment scans. The primary end point was local response. Disease-free survival (DFS), overall survival (OS) and treatment-related morbidity were secondary end points.
Results: Median reductions in gross primary and nodal disease volumes on mid-treatment scans were 34% and 43.2%, respectively. 16 patients experienced grade 3 acute mucositis. No patient had grade 3 or above haematologic toxicity. Four patients developed local recurrences, all within the RT field. Median DFS and OS were 17.5 and 23.5 months, respectively.
Conclusion: Adaptation to changes in the anatomic and tumour volume or shape may help tilt the balance towards more efficient dose delivery as well as better normal tissue sparing.
Advances in knowledge: This study supports the need for adaptive replanning for minimizing normal tissue toxicity without compromising local control and adds to the existing body of literature.

INTRODUCTION

Head and neck cancers (HNC) constitute one of the most common cancers in the developing world. In a recent study from India, of approximately 556,400 cancer deaths in the year 2010, the most fatal cancers were HNC, including malignancies of the oral cavity, lip and pharynx.[1,2] They constitute 5.1% of the total cancer incidence in both genders and 14% of total cancer cases in males. Over 60% patients present with locally advanced disease. Locoregional failure constitutes the predominant recurrence pattern, and most fatalities result from uncontrolled local and/or regional disease.[2,3]

Definitive radiotherapy (RT) plays an important role in the management of locally advanced squamous-cell carcinomas. RT planning and treatment delivery for HNC has come a long way from being two-dimensional to three-dimensional. Use of highly conformal techniques such as intensity-modulated radiotherapy (IMRT) and image-guided radiotherapy (IGRT) have allowed radiation oncologists to deliver curative radiation doses to the tumour with higher accuracy, thereby restricting the dose to organs at risk and consequently reducing treatment-related morbidity. However, the sharp dose gradients imply that there should be no or minimal changes in the patient, tumour and organs at risk position.[4] Although superior to conventional RT, IMRT or volumetric modulated arc therapy still causes significant toxicity. This may be explained, in part, by the fact that IMRT does not compensate for changes in the location of the disease and normal anatomy during the treatment course. However, the location, geometry and size of the tumour and normal tissues can change during the course of treatment. Such changes occur owing to multiple factors like shrinkage of primary tumour and nodal disease as a result of treatment response, alterations in the normal tissue bulk and position with respect to the target, weight loss and resolution of post-operative soft tissue changes.[5–10] It is recognized that primary tumours can shrink volumetrically by up to 90% and parotid glands can involute and shift medially by up to 1 cm during treatment course.[5] Applying the original plan to the altered patient anatomy can lead to higher than intended dose to the surrounding normal structures such as the parotid glands and spinal cord.

Brief Communication

Need of collaborative radiology–radiation oncology workshops in decision making for head and neck cancer (HNC) management in India: Perspectives of the radiation oncologists

ABSTRACT

Background: In India, head and neck cancer (HNC) has always been a challenge to treatment due to its various disease-, treatment-, and patient-related factors. Recent developments in the field of both radiology and radiation oncology brings us to a stage where combined collaborative efforts are required for proper management of HNC. The article identifies the potential areas of such need through online survey.

Materials and Methods: This anonymous online survey with specific questions and their responses from radiation oncology community identifies potential areas of radiology expertise as perceived by a radiation oncologist. The questions were simple Likert-type and the best possible response was sought for.

Results: There were 57 email responses and majority (37) agreed upon the extreme importance of such collaborative efforts. The major areas where a radiation oncologist would seek help are target volume delineation and response evaluation posttreatment in HNC, though other areas are also important albeit to a lesser degree.

Conclusion: There is urgent need of radiology–radiation oncology workshops in managing HNC in the modern era of image-based and image-guided treatment. Future larger hospital-based survey would determine need on a large scale basis at resolving these issues.

KEY WORDS: Collaborative workshops, head and neck cancer, modern imaging, radiotherapy

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Original Article

Perception of quality in a Radiation Oncology Department: Is it different for patients and health care providers?

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Abstract

AIM: Patient satisfaction is increasingly being identified as an important benchmark in health care industry. Studies addressing patients' perceptions of quality are available but there is paucity of data regarding the perception of health care providers towards their own services. This study was undertaken to compare the satisfaction level between the patients and the staff from a Radiation Oncology Department.

MATERIALS AND METHODS: A common 16-item questionnaire addressing various aspects of patient care was served to 40 patients and 40 staff members. The responses were statistically evaluated to assess the satisfaction level among the two groups and the scores were compared to assess the agreement between two groups.

RESULTS: Overall, satisfaction level of both groups regarding quality of services ranged from "good" to "excellent". A high level of agreement was observed between the two groups. The physician's ability to give an explanation to patients, helping attitude of the staff and the staff's concern for patient safety were the most satisfying features of the department while inconvenience during scheduling of appointments, billing and registration process, status of the changing rooms and inter-department coordination were the least satisfying features.

CONCLUSION: A high level of satisfaction may be achieved from the consumers if service providers are trained to assess the needs and expectations of consumers and to critically evaluate themselves. The service provider's perception regarding their own services may serve as a preliminary indicator of overall quality. Future studies with more participants in different setting may further explore this hypothesis.

Key Words: Health care, patient, perception, quality-of-care, satisfaction, service-providers

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PICTORIAL REVIEW

Simple diagrammatic approach to delineate duodenum on a radiotherapy planning CT scan

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ABSTRACT

In recent years, there has been increasing application of intensity-modulated radiotherapy and stereotactic body radiotherapy for the treatment of abdominal malignancies (stomach, pancreas, liver, spinal metastases). This warrants accurate delineation of organs at risk, especially the duodenum. The tortuous and curvy anatomy of duodenum often indistinguishable from adjoining organs is a practical challenge. Radiation Therapy Oncology Group (RTOG) has already published upper abdominal normal structure contouring guidelines to ease the delineation process. This pictorial essay following the RTOG guideline elaborates the step-by-step identification of the different parts of duodenum in relation to the adjoining important structures.

INTRODUCTION

The small bowel has three distinct portions namely duodenum, jejunum and ileum. All of these have large surface area and are important for nutrient absorption. In the management of pancreatico-hepatobiliary malignancies especially in the era of stereotactic body radiotherapy (SBRT), duodenum inadvertently became an important organ at risk (OAR). The importance primarily depends upon the location. Both acute (abdominal cramps, diarrhoea) and late (fibrosis, adhesion and obstruction) radiation toxicities have been very important for small bowel.[1,2]

The essence of radiation oncology contouring relies upon accurate delineation. Keeping all these in mind, Radiation Therapy Oncology Group (RTOG) published upper abdominal normal structures contouring guidelines.[3] Even with the existing guideline, the challenge in day-to-day practice is to delineate duodenum easily and accurately. We intend to propose a simple step-by-step pictorial essay of identifying all the four parts of the duodenum with RTOG guideline as the benchmark.

METHODS AND MATERIALS

For the ease of identification, we considered planning CT scans from patients planned for treatment of non-abdominal sites. Patients were asked to fast 4 h prior to CT scan. Only intravenous contrast was given with 2 ml kg^{-1} of body weight with flow rate of 5 ml s^{-1}, and images were acquired in portal phase after a gap of 60 s from the time of injecting contrast. Planning scans were acquired in portal phase. The planning CT scans were obtained in free breathing with patient in the supine position and abdominal cast were applied.

Planning images were taken from the root of neck up till upper border of pelvis (L5–S1 junction) with 3-mm slice thickness in Siemens Biograph™ PET/CT scanner (Siemens Healthcare, Erlangen, Germany) with 64 slices. The planning images were transferred to Focal Sim planning software (Elekta, Crawley, UK) and preset abdominal window mode (Level 600; Width 40) was selected for contouring.

Before beginning the step-by-step contouring procedure, we would briefly outline the radiological anatomy of duodenum as follows:[3,4]

first portion: begins after the pylorus, is retroperitoneal after the first approximate 5 cm

second (descending) portion: mostly vertical, encircling the head of pancreas and located to the right of the IVC (inferior vena cava) at vertebral levels L1 to L3

third (transverse) portion: mostly horizontal, crosses in front of the aorta and IVC and marks the end of the C-loop of the duodenum. On axial CT slices, third part is the last to appear.

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Preliminary results of CyberKnife stereotactic radiotherapy (SBRT) boost for primary head and neck cancers: is it the future direction?

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Abstract

Aim To analyse the preliminary results of CyberKnife stereotactic radiotherapy (SBRT) boost in primary head and neck cancer patients among Indian population.

Methods and materials A total of nine patients of primary head and neck cancer were treated with CyberKnife SBRT boost after intensity-modulated radiation therapy (IMRT). The median phase 1 IMRT dose was 54 Gy/27 fractions. Histological types included squamous cell carcinoma (*n*=7) and adenoid cystic carcinoma (*n*=2). Response was evaluated using positron emission tomography/computed tomography and detailed clinical examination.

Results As a preliminary analysis with median follow up of 8 months (range: 6–19 months), phase 2 median tumour volume of 16·3 cc and a median dose of 5 Gy per fraction, eight patients had loco-regionally stable disease and one had distant metastasis. With objective assessment five patients had complete response. Treatment was well tolerated with no grade 3 or more acute toxicities directly related to CyberKnife boost.

Conclusion CyberKnife SBRT boost is an attractive option for primary head and neck cancers especially where disease is in close proximity to critical structures hindering radical dose delivery. Future prospective analysis and optimum assessment of total biological effective dose (BED) in a properly selected case might actually benefit the use of CyberKnife SBRT boost.

https://www.cambridge.org/core/journals/journal-of-radiotherapy-in-practice/article/preliminary-results-of-cyberknife-stereotactic-radiotherapy-sbrt-boost-for-primary-head-and-neck-cancers-is-it-the-future-direction/74331F31A3DBB3A0A7736324A3BAEB22

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Cyberknife fractionated radiotherapy for adrenal metastases: Preliminary report from a multispecialty Indian cancer care center

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Original Article

Abstract

Purpose: Metastasis to adrenal gland from lung, breast, and kidney malignancies are quite common. Historically radiotherapy was intended for pain palliation. Recent studies with stereotactic body radiotherapy (SBRT) including Cyberknife robotic radiosurgery aiming at disease control brings about encouraging results. Here we represent the early clinical experience with Cyberknife stereotactic system from an Indian cancer care center. The main purpose of this retrospective review is to serve as a stepping stone for future prospective studies with non- invasive yet effective technique compared to surgery. **Methods:** We retrospectively reviewed four cases of adrenal metastases (three: lung and one: renal cell carcinoma) treated with Cyberknife SBRT. X sight spine tracking was employed for planning and treatment delivery. Patients were evaluated for local response clinically as well as with PETCT based response criteria. **Results:** With a median gross tumor volume of 20.5 cc and median dose per fraction of 10 Gy, two patients had complete response (CR) and two had partial response (PR) when assessed 8-12 weeks post treatment as per RECIST. There was no RTOG grade 2 or more acute adverse events and organs at risk dosage were acceptable. Till last follow up all the patients were locally controlled and alive. **Conclusion:** Cyberknife SBRT with its unique advantages like non- invasive, short duration outpatient treatment technique culminating in similar local control rates in comparison to surgery is an attractive option. World literature of linear accelerator based SBRT and our data with Cyberknife SBRT with small sample size and early follow up are similar in terms of local control in adrenal metastases. Future prospective data would reveal more information on the management of adrenal metastases.

Keywords: Cyberknife; Adrenal Metastases; Local Control; PETCT Response; X Sight Spine Tracking

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FULL PAPER

Adaptive radiotherapy in lung cancer: dosimetric benefits and clinical outcome

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Objective: Anatomical changes during radiotherapy (RT) might introduce discrepancies between planned and delivered doses. This study evaluates the need for adaptive treatment in lung cancer RT.

Methods: 15 patients with non-small-cell lung cancer, undergoing radical RT with or without concurrent chemotherapy, consecutively underwent planning CT scans at baseline and after 44–46 Gy. Target volumes were delineated on both scans. Phase I delivered 44–46 Gy to the initial planning target volume (PTV). Two Phase II plans for 16–20 Gy were developed on initial and mid-treatment scans, the treatment being delivered with the mid-treatment plan. The second CT structure set was fused with the initial scan data set using dose wash. Volumetric and dosimetric changes in target volumes and critical structures were assessed.

Results: There was significant reduction in primary gross tumour volume (34.00%; $p = 0.02$) and PTV (34.70%; $p < 0.01$) in the second scan. In Plan 2, delivering the same dose to the initial PTV would have resulted in a significantly higher dose to the lung PTV ($V20$, 52.18%; $V5$, 21.76%; mean, 23.93%), contralateral lung (mean, 29.43%), heart ($V10$, 81.47%; $V5$, 56.62%; mean, 35.21%) and spinal cord (maximum dose, 37.53%).

Conclusion: Treatment replanning can account for anatomical changes during RT and thereby enable better normal tissue sparing, while allowing radical target doses with the possibility of maximizing local control.

Advances in knowledge: This study supports the sparse dosimetric data regarding the quantitative tumour volume reduction, re-emphasizing the need for adaptive replanning for minimizing normal tissue toxicity without compromising local control, and adds to the existing body of literature.

Lung cancer is the commonest cause of cancer mortality worldwide.[1] Annually, 1.4 million new cases are diagnosed, accounting for 12% of all cancer cases.[2] Chemoradiotherapy remains the standard of care for patients presenting with an advanced stage and for those whose tumours are inoperable owing to medical reasons, although this results in a dismal prognosis, and many patients succumb to locoregional failure or distant metastases.[3] Several dose escalation trials[4,5] have reported better local control with increased freedom from relapse and survival. On the other hand, RTOG 0617[6] has shown a higher locoregional failure rate and shorter overall survival (OS), possibly owing to deaths related to the effects from high-dose three-dimensional conformal radiotherapy (3D-CRT) and intensity-modulated radiation therapy (IMRT) on normal lungs and perhaps the heart. A meta-analysis by Auperin et al[7] has confirmed that improved local control rates influence OS. With increments of every 1 Gy above the conventional prescription dose the 3- to 5-year survival rates improve by 1% with a decrease in hazard from death by 3%.[5] However, dose escalation is limited by the tolerance of normal tissues, such as the lung, heart, oesophagus and spinal cord.[6,8] One important dose-limiting toxicity in lung cancer is radiation pneumonitis. In the modern era of radiotherapy (RT) technology, its occurrence and severity correlates well with $V20$ and mean lung dose.[9,10]

Modern RT techniques, such as 3D-CRT, IMRT, stereotactic body RT (SBRT) and volumetric-modulated arc therapy (VMAT), can potentially improve target coverage with a much steeper dose gradient and minimize irradiated normal tissue volumes.[11–13] Precision of radiation therapy is challenged by substantial geometrical uncertainties in accuracy of imaging, treatment planning, treatment delivery and tumour shrinkage during treatment. Tumour volume shrinkage during treatment for lung cancer is well known.[14,15] Woodford et al[16] reported that replanning can better normal tissue sparing and improve the therapeutic ratio further if the gross tumour volume (GTV) decreases by ≥30%.

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Satisfaction Level and Perception of Quality in Cancer Care: A Comparison between Patients and Health Care Providers

Kuldeep Sharma, Tejinder Kataria, Shyam Singh Bisht, more...
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Abstract

Consumer's perception of health care quality and his satisfaction is being identified as an important issue in health care industry. Studies addressing patients' perceptions of quality are available but there is paucity of data regarding the perception of health care providers (service-providers) towards their own services. This study was undertaken to compare the satisfaction level between the patients and health care providers from a radiation oncology department.

A common 16-item questionnaire was served to 40 patients and 40 staff members. The responses were statistically evaluated to assess the satisfaction level among the two groups and the scores were compared to assess the agreement between two groups. Overall, satisfaction level of both groups regarding quality of services ranged from 'good' to 'excellent'. A high level of agreement was observed between the two groups. The physician's ability to give explanation to patients, helping attitude of the staff and the staff's concern for patient safety were the most satisfying features of the department while inconvenience during scheduling of appointments, billing and registration process, status of the changing rooms and inter-department coordination were the least satisfying features.

A high level of satisfaction may be achieved from the consumers if service providers are trained to assess the needs and expectations of consumers and to critically evaluate themselves. The service-providers' perception regarding their own services may serve as a preliminary indicator of overall quality. Future studies in different settings with more number of patients may further explore our results.

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Parotid metastasis from carcinoma urinary bladder treated with CyberKnife-based stereotactic body radiotherapy: case report and review of literature

Tejinder Kataria [a1], Shyam S Bisht [a1], Deepak Gupta [a1], Ashu Abhishek [a1] ...

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Abstract

Metastases to the parotid region are relatively infrequent and originate primarily from head and neck cancer. Metastases of an infraclavicular origin are uncommon. Moreover, metastasis from the carcinoma of urinary bladder (CUB) to any part of the head and neck, including parotid gland, is rare. Surgery and chemotherapy are usually offered. We report a case of solitary parotid metastasis from CUB, who was successfully treated with stereotactic body radiotherapy (SBRT) using CyberKnife. SBRT is a safe alternative in cases unwilling/unfit for surgery.

https://www.cambridge.org/core/journals/journal-of-radiotherapy-in-practice/article/parotid-metastasis-from-carcinoma-urinary-bladder-treated-with-cyberknifebased-stereotactic-body-radiotherapy-case-report-and-review-of-literature/DE1D699AEE7FC2ACB061F8B1828FA005

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CASE REPORT

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Stereotactic body radiotherapy with CyberKnife in solitary adrenal metastasis

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Abstract

Metastases to adrenal glands from solid tumors are fairly common. The incidence varies from 17.6% to 35% in lung primaries and 13-27% in other malignancies. Most of these lesions are clinically occult. Historically, the role of radiotherapy was limited to palliation of pain in symptomatic lesions. However, with the advent of more conformal techniques such as stereotactic body radiation therapy, the focus has shifted to treatment of such lesions with curative intent in selected situations. We treated a patient of non-small cell lung cancer with solitary adrenal metastasis, following partial response to chemotherapy. The adrenal lesion was treated with CyberKnife while the lung lesion was treated with intensity modulated radiotherapy, both with curative intent.

Keywords: Adrenal gland, CyberKnife, metastasis

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Original article

Incidental radiation to axilla in early breast cancer treated with intensity modulated tangents and comparison with conventional and 3D conformal tangents

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ABSTRACT

Purpose: To analyze incidental radiation doses to minimally dissected axilla with Intensity modulated radiotherapy (IMRT), 3D conformal radiotherapy (3DCRT) and standard tangents (ST).
Methods & materials: We prospectively evaluated incidental radiation to axilla in fifty cases of early breast cancer treated with breast conservation surgery with sentinel node biopsy alone followed by whole breast irradiation with IMRT. Three plans were devised for each CT dataset, comprising ST, 3DCRT and IMRT tangents. Doses to axillary nodal levels I, II and III were evaluated for mean dose, V95, V90, V80 and V50. Comparisons were made using ANOVA.
Results: The mean doses delivered to axilla by the three techniques (IMRT, 3DCRT, ST) were: 78% (range 67–90, SD ± 5.2%), 80% (63–95, ±7.5%) and 87% (73–98, ±4.8%) for level I (IMRT vs ST; $p = 0.037$); 70% (46–89, ±12.4%), 72% (34–93, ±15.5%) and 65% (29–87, ±11.8%) for level II; and 51% (28–76, ±11.1%), 53% (19–86, ±13.7%) and 41% (6–72, ±10.6%) for level III, respectively. V90 values (volume receiving 90% of dose) for the three techniques were 49% (43–53, ±2.7%), 57% (51–65, ±3.1%) and 73% (65–80, ±3.4%) for level I (IMRT vs ST; $p = 0.029$); 35% (26–42, ±4.7%), 41% (33–50, ±4.2%) and 25% (17–36, ±4.5%) for level II (IMRT vs ST; $p = 0.068$); and 15% (9–22, ±3.4%), 16% (10–24, ±3.7%) and 8 (5–12, ±3.1%) for level III (IMRT vs ST; $p = 0.039$), respectively.
Conclusion: Axillary levels I and II (lower axilla) receive substantial amount of incidental radiation doses with all the three techniques; however, conformal techniques (IMRT, 3DCRT) deliver significantly lesser incidental radiation to lower axilla than ST technique.

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Frame-based radiosurgery: Is it relevant in the era of IGRT?

Tejinder Kataria[1], Deepak Gupta[1], KP Karrthick[1], Shyam Singh Bisht[1], Shikha Goyal[1], Ashu Abhishek[1], HB Govardhan[1], Kuldeep Sharma[1], Puneet Pareek[1], Aditya Gupta[2]

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Abstract:

Purpose: To assess the setup errors and intrafraction motion in patients treated with frame-based and frameless stereotactic radiosurgery (SRS). **Materials and Methods:** Ten patients treated with frame-based and six patients treated with frameless radiosurgery were prospectively enrolled in the study. Leksell frame was used for frame-based and a customized uniframe orfit cast for frameless techniques. Cone beam computed tomography (CBCT) scans were taken immediately before and after each treatment to evaluate the positional accuracy and corrections applied with the use of hexapod couch for both groups. **Results:** The mean translational shifts with frame-based SRS were 1.00 ± 0.30 mm in the lateral direction (X), 0.20 ± 1.20 mm in craniocaudal direction (Y) and -0.10 ± 0.31 mm in the anteroposterior direction (Z). The rotational shifts for frame-based treatments were as follows: roll 0.32 ± 0.70, pitch 0.44 ± 0.66 and yaw 0.20 ± 0.4. For frameless SRS, translational shifts were -0.40 ± 0.90, 1.10 ± 1.10, and 0.50 ± 1.30 mm in X, Y, and Z directions, respectively, and rotational shifts were -0.11 ± 0.78, 0.20 ± 0.44, and 0.29 ± 0.35 in roll, pitch, and yaw, respectively. Intrafraction shifts with frame-based SRS were: X = 0.60 ± 1.80 mm, Y = 0.20 ± 0.60 mm, and Z = 0.00 ± 0.05 mm; and rotational shifts were: roll 0.01 ± 0.27, pitch 0.06 ± 0.15, and yaw 0.01 ± 0.09. For frameless SRS, these were: X = 0.11 ± 0.20 mm, Y = 0.20 ± 0.40 mm, and Z = 0.20 ± 0.20 mm and rotational shifts were: roll 0.09 ± 0.23, pitch 0.00 ± 0.12, and yaw 0.00 ± 0.09. **Conclusions:** In our experience, set up accuracy of frameless SRS is as good as frame-based SRS. With availability of verification methods such as CBCT and hexapod couch, an accurate and precise treatment delivery is feasible with frameless techniques.

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