EDITORIAL

TO BE A GOOD SURGEON

The surgeon's craft has advanced from the days when a barber or butcher treated cuts, burns and fractures. It has evolved from the days when he was ridiculed as a primitive occupation in the eyes of physicians, lawyers and theologians. It is no wonder that now surgeons perform more than 230 million major operations annually across the world. The recent trend of refined specialization has seen an enormous improvement in surgeon's capability and outcomes.

This article illustrates few attributes of a good surgeon. I believe a good surgeon has two vital attributes. Firstly integrity, secondly the ability to make good decision.. They need to know how to do it, when to do it, and when not to do it. During their training and beyond, surgeons need advice from a senior figure, a mentor or a guru. One can also learn skills by observation of role models, both positive (I want to be like that) and negative (I definitely don't want to do it that way).

The surgeon must look objectively at a bad result and attempt to learn from mistakes. Careful analysis of errors in judgement or technique leads to better care for future patients. The tendency to blame problems on others rather than profiting from the experience is reprehensible.

Knowing when not to treat a patient is a dilemma that often plagues medical professionals. Almost all of our training is centred on when to intervene, when to heal with steel. There is no formal training on when to discuss the inevitable with patients and family.

Surgeons need to be caring and able to communicate to patients. Communicating with patient and relatives requires no less skill than performing an operation. We can learn about life and its frailty but more importantly recognize when to concede defeat in a situation in which death will always be the victor. Surgeon labours every day in this fight. Another attribute of a good surgeon is strict discipline. Discipline is desirable to provide best care. Discipline is required in following prudent procedures and in functioning on a day to day basis. Discipline keeps the mind and body sound in an extremely demanding environment. Some would say discipline is the hardest to attain and maintain, that is why it takes many years to prove one's mettle as a surgeon.

A surgeon's life is unique. They are expected to live up to the expectations of many. The thousands of people a surgeon meets throughout his life will all demand the highest that a human can offer. A surgeon has to balance work life with personal life, balance being on call, researching, teaching, consulting and caring family, children and social responsibilities. However, a surgeon is a man before he is a surgeon.

Excellent diagnostic skill is also another important attribute of a good surgeon. Patients also expect surgeons to possess flawless ethical and moral judgement and display a great deal of compassion.

A good surgeon knows exactly what is expected from him. He will place his patients first, choosing from his diagnostic armamentarium wisely, operating bravely, and placing his instruments down graciously. He is a person of integrity. He will be formidable standard bearer for his colleagues.

If you want to know which of the surgeons are truly excellent ask your anesthetists. Some people say fast surgeons are excellent surgeons. I think every surgeon has a natural pace and it varies from person to person. I think efficient surgeon operates at his own pace but every movement has a purpose. Nothing is wasted. It looks pretty much effortless, like a world class dancer who makes moves that you know are fiendishly difficult look as easy as a walk in the park.

To be a good surgeon- be affable, be available, get a mentor (Guru)- people who aren't your mentors also have things to teach you-what to do, even what not to do, listen to lots of advice and opinion and formulate your own take based on all the information. A good surgeon must learn about management, leadership and teamwork and big part of being a doctor is to be a leader as part of the team.

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LUNG CANCER – EPIDEMIOLOGY

Epidemiology which studies the distribution and determinants of health related states and event in a specified population forms the basis for primary and secondary prevention of disease. The understanding of the epidemiology of lung cancer which is a huge health burden helps the government in the introduction of screening or risk reduction intervention in national programs and the clinicians in the treatment of patients.

Lung Cancer Statistics

In 2012, an estimated 1.8 million new cases of lung cancer were diagnosed globally, accounting for approximately 13% of the global cancer burden and 1.6 million deaths making it is the commonest cause of cancer related mortality.This exceeds the combined number of deaths from breast ,colon and prostrate.

Economic Burden of Lung Cancer

The economic burden of the disease is huge in terms of cost of treatment and loss of productivity from deaths..According to a July 2011 paper by the Indian Statistical Institute, the average cost of cancer care per patient in a subsidised government hospital the All India Institute of Medical Sciences in New Delhi was Rs 36,812, while in the private sector it will be multiple fold. The economic burden increases as the stage of cancer increases.

Gender and Age Differences

It is more common in men than women and predominantly occurs in the age group of 50 -70 years. There is a disturbing trend observed of an increasing prevalence of lung cancer in women and younger patients not restricted to the west.

Survival Rates

The overall 5-year survival rate of 17.8 percent for lung cancer is much lower than other leading cancer sites such as colon (65.4%), breast (90.5%) and prostrate (99.6%). For stage 1,2 disease the 5-year survival rate is about 54 % which constitute the minority 15 % of cases and the majority of cases present at an advanced stage. For metastatic stage 4 disease the 5-year survival is only 4%.

Tobacco Smoking and Lung Cancer

Epidemiological studies in the early 1950's by British and American using the case control methods had shown a strong association between cigarrete smoking and risk of lung cancer. As per WHO tobacco use is the most important risk factor for cancer causing around 20% of global cancer deaths and around 70% of global lung cancer deaths.

Other Cause for Lung Cancer

Radon which is a tasteless, colourless and odourless gas that is produced by decaying uranium and occurs naturally in soil and rock, occupational exposures to carcinogens asbestos, uranium, coke and outdoor air pollution and in developing countries, exposure to fumes from cooking stoves and fires.

Lung Cancer Pathology

The histopathological characteristic has changed in the west with the adenocarcinoma becoming more common than the squamous cell variant. In India squamous cell carcinoma is more common but various centers are now reporting adenocarcinoma as the commoner type especially in women and younger nonsmoking age group.

The Indian Scenario

The burden of the disease is huge with India contributing 1 million of the current 5 million deaths in world, in 2020, this figure is projected at 1.5 million. It forms 6.9 % of all new cancer cases and 9.3 % of all cancer related deaths in both sexes, it is the commonest cancer and cause of cancer related mortality in men, with the highest reported incidences from Mizoram in both males and females (age adjusted rate 28.3 and 28.7 per 100,000 population in males and females) and lowest in Barshi – a rural registry in Western India. Tobacco smoking is primarily responsible for lung cancer in India, prevalent in 29% of adult males, 2.5% of adult females, 11.7% of male collegians, and 8.1% among school children and adolescents. Non-smokers account for 15% of lung cancer cases and these cases are often attributed to a combination of genetic factors, radon gas, asbestos, pesticidesand air pollution including passive smoking. The most prevalent lung cancer type histology is squamous cell carcinoma (44.73%) and adenocarcinoma (30.26%) with 250,000 to 300,000 new cases detected each year.

Tuberculosis and Lung Cancer In India

In India most of lung cancer present at an advanced stage and it has been observed that lung cancer in non-smokers is diagnosed at a more advanced stage is probably because of the fact that when a non-smoker presents with a lung mass, cancer is not at the top of the list of differential diagnoses because of the high prevalence of tuberculosis. A study by Singh et al., found that 14 of 70 (20%) patients of lung cancer wrongly received anti-tuberculosis treatment for a median duration of 4.46+/-3.15 months.

India as a Hub for Clinical Trials for Lung Cancer

India has been labeled as hub since the widespread use of tobacco products primarily triggers this malignancy. Cancer incidence in India is much lower than those in developed countries with the average national age adjusted rate being ~120 compared with >300 per 100,000 per year in developed countries. But India adds ~1 million new cases of cancer every year because of the sheer size of its population. Patients in India are often diagnosed in late stages with very limited treatment options making it an ideal pool for clinical trials in the search for more effective treatment regimes and modalities in the hope of disease arrest or regression..."These trials ultimately help Indian patients by giving them access to new anti-cancer agents at a much earlier stage than in the past. Nearly 20% of cancer patients in many global cancer drug research trials are Indians from India. If India had not taken part these above mentioned trials would have taken 2-3 years more for patient recruitment. By contributing towards clinical trials on a global scale, India will find

solutions for its own problem of cancer.

Summary

Lung cancer is the leading causes of cancer deaths in India and globally. Approximately 85% of lung cancer patients in India are diagnosed at an advanced stage with very limited therapeutic options and constitute a huge pool for newer clinical research. It is time that that lung cancer comes to the focus and detection programs in India could be integrated with TB control programs with which it is most commonly mistaken.

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ADAPTIVE RADIOTHERAPY

Introduction

Various changes that may occur during the course of radiotherapy are tumor shrinkage (or occasionally growth), weight loss or changes in shape and size of organ(s). These changes lead to relative positional change between tumor and normal organs. Hence, a single original plan generated at the beginning of treatment may not deliver actual dose during each subsequent treatment fractions, leading to suboptimal treatment. It requires a re-simulation and re-planning. Adaptive Radiotherapy (ART) is defined as changing the radiation treatment plan delivered to a patient during a course of radiotherapy to account for temporal changes in anatomy (e.g. tumor shrinkage, weight loss or internal motion) or changes in tumor biology or function (e.g. hypoxia). ART involves the modification of the initial plan, including changing beam apertures or intensity patterns. It is slightly different from IGRT where frequent imaging (to look for tumor, organs or their surrogates just prior or during treatment) is done, changes in patient position relative to treatment plan is assessed, and finally couch shifts are applied to account for the changes, and treatment executed modifying the initial plan, thus increasing treatment precision.

Re-plan may be done at three different time points:

* OFFLINE - between fractions
* ONLINE- immediately prior to a fraction or
* Real time - during a fraction

Changes that require ART:

Random Changes: Certain changes, which are random in occurrence such as day-to-day prostate motion requires ONLINE ART. The techniques to deal with these random changes are patients specific margins, plan libraries, daily plan adjustments etc.

I.   Patient specific margins: PTV margins are determined based on patient-specific observations.

II. Plan libraries: a set of plans are generated anticipating shape changes, and best plan is selected each day from the plan library.

III. Daily plan adjustments: here daily MLC shapes are adjusted using either defomable intensity maps, online re-optimization, or segment aperture morphing followed by segment weight optimization.

Progressive Changes: Changes that are progressive in occurrence such as active tumor shrinkage, weight loss, setup uncertainty etc. require OFFLINE ART where re-simulation and re-planning is done in the middle of treatment, and implemented.

Sites that require ART:

ART can be performed in almost sites, two most common are head and neck and prostate.

Head and Neck Cancer: Various factors that contribute to the need for ART are setup uncertainty, active tumor shrinkage, weight loss, tight conformality and small margins for errors in the IMRT for this site. Study has shown that GTV shrinks 9-15% per week, ipsilateral parotid shrinks 3-6% per week, and moves medially by approximately 0.8 mm per week, and spine moves 3.5mm at C1 level, 5.6mm at C6 level. These changes cannot be corrected by simple couch shifts. Therefore, re-simulation and re-planning is required. Figure 1 is an example of anatomic change during the course of treatment.

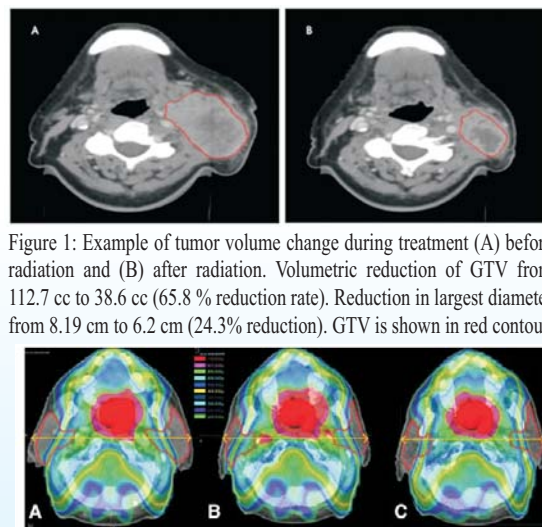Figure 2 and 3 shows the anatomical variation and dose distribution with and without re-planning.

Figure 1: Example of tumor volume change during treatment (A) before radiation and (B) after radiation. Volumetric reduction of GTV from 112.7 cc to 38.6 cc (65.8 % reduction rate). Reduction in largest diameter from 8.19 cm to 6.2 cm (24.3% reduction). GTV is shown in red contour.

Figure 2: Illustration of the anatomical variations on the dose distribution. IMRT dose distributions at different times for a given patient, showing the PG overdose without replanning (B) and the benefit of replanning (C). A: Planned dose on the pre-treatment CT (CT0). B: Actual delivered dose without replanning during the treatment (Week 3). C: Adaptive planned dose with replanning to spare the parotid glands (PG) at the same fraction (Week 3). The red line shows PGs. The full red represents the Clinical Target Volume (CTV70). The arrow show the head thickness. Figure 1B and 1C compared to

1A shows that the PGs, the CTV70 volumes, and the neck thickness have decreased. These anatomical variations have led to dose hotspots in the neck, close to the internal part of the two PG (Figure 1B). Replanning (Figure 1C) allowed to spare the PG even better than on the planning (Figure 1A).

Figure 3: The dose distributions after applying (A) the initial and (B) adaptive plans to the replanning CT. CTV70 and CTV56 are shown as purple- and green-shaded areas. The 70 Gy and 56 Gy isodose lines are shown in red and yellow.

Prostate Cancer: Various factors that contribute to the need for ART are moving target within pelvis predominantly in antero-posterior and cranio-caudal direction, motion caused by variations in rectal and bladder filling etc. Studies have shown Online ART decreases PTV margin, results in minimal effect on bladder although rectal volume receiving prescription dose may increase.
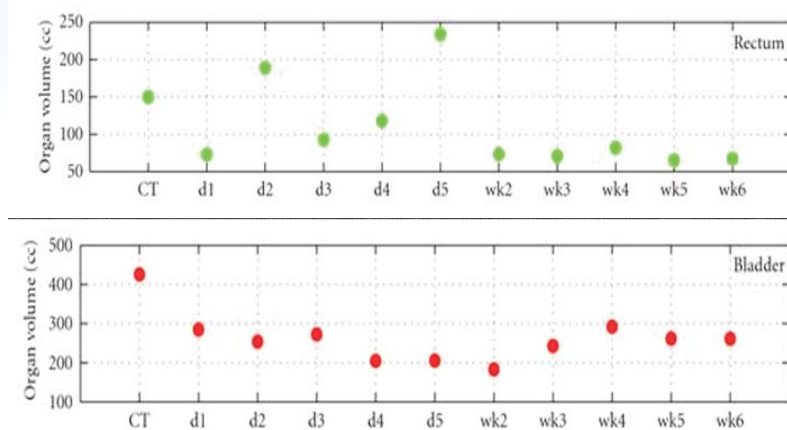
Figure 4: Daily structure variations of one patient due to bladder and rectum fillings. Shown in the figure are 11 images including 1 planning CT and 10 cone-beam CT (CBCT) images taken once per day for the first 5 days of treatment (d1–d5), and once per week thereafter (w2–w6). Colored contours: red—bladder, green—rectum, black—CTV

Figure 5: Flow chart to show online plan adaptation process

Summarizing, ART is customizing each patient's treatment plan in an effort to correct for deficiencies in the simulation process, correct for anatomical changes beyond image guidance, improve the conformality of the delivered plan, reduce margin requirements for IGRT and reduce normal tissue dose by treating a small target volume.
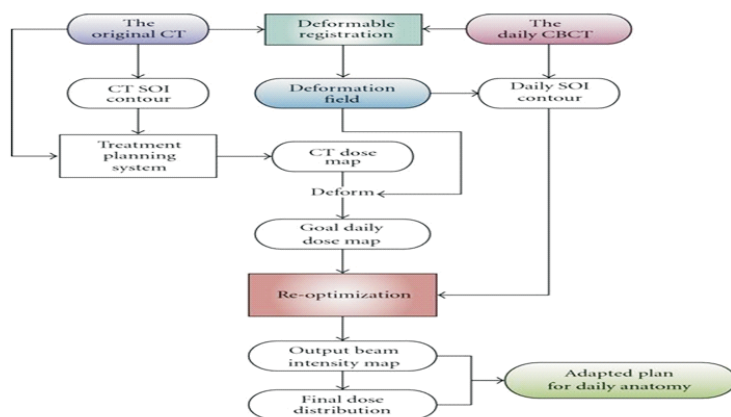
Dr. Munish Gairola, Director – Radiation Oncology
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Architect's Impression of RGCIRC (post expansion)

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