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EDITORIAL

HAZARDS OF BEING A SURGEON!!

Are you a doctor ? Are you a surgeon ?

Your daily workload renders you susceptible to a variety of common work-related illnesses. You are exposed to a number of occupational hazards in your professional work. These hazards include sharp injuries, blood borne pathogens, latex allergy, laser plumes, hazardous chemicals, anesthetic gases, equipment hazards, static postures, and job related stressors. However, we pay little attention to our health, and neither do we seek the appropriate help when necessary. It is observed that occupational hazards pose a huge risk to our personal well-being.This editorial give you a comprehensive presentation of the dangers lurking in the surgeon's milieu.

In the surgical team, surgeons sustain the highest risk of injury. Assistant surgeons and surgeons-in-training are close behind. Review of the literature shows that among healthcare workers, sero-prevalence for hepatitis B is two to four times higher than that of the general population. In addition to needle-stick injuries or scalpel wounds, which occur in 1.7–15% of operations, members of the operation room team are exposed to skin contamination from patients' blood in 6–50% of cases. Injuries are more common when procedures are complex, entail high blood loss, or involve multiple surgical teams. With needle injuries, transmission of the infective agent can be expected in 10–30% of healthcare workers if the patient is infected with hepatitis B, 1–10% with hepatitis C, and 0.1–0.3% with HIV.

A study of French surgeons estimated that the typical general surgeon experiences 0.8 injuries per 100 h of operating time, or 210 injuries throughout the course of a career, resulting in a 6.9% lifetime risk of contracting hepatitis C and a 0.15% lifetime risk of developing HIV. The perceived reasons of injury are lack of appropriate operating equipments, lack of proper assistance during surgery and lack of the required surgical skills to conduct a safe procedure.The surgical culture is"maintain the patient first at all costs", and when an accident occurs in the operating room, the surgeon's first inclination is to save the patient and complete the operation. Surgeons might be reluctant to report accidents for fear of being barred from further practices. The risk that a surgeon will acquire an active infection from an injury or exposure during an operation depends upon the severity of the injury, the type of needle involved (hollow-bore needles are more likely to transmit infection than solid needles), the rate of infection among the patient population, and the viral load of the patient's blood. The risk can be reduced substantially by relatively simple prophylactic measures, including double gloving (which reduces the frequency of skin exposure to blood by more than 85% and reduces blood on the needle by 95%), immunization against hepatitis B, and post exposure vaccination and/or administration of immunoglobulin (for hepatitis B) or antiretroviral drugs (for HIV shortly after exposure). Surgeons generally comply poorly with these measures, except for hepatitis B immunization, which is now required by most hospitals. Double gloving is not widely accepted, as many surgeons believe it impairs sensation and dexterity.

Noise-induced hearing loss has been reported amongst orthopaedic surgeons due to the use of electric and air-powered drills and saws. The hazards of exposure to ionizing radiation are well documented. Surgeons are exposed to scattered radiation while carrying out intra operative x-ray, fluoroscopy,radiation from laser based instruments. In orthopaedics, the hands of the operating surgeon receive the highest radiation exposure. Laser equipment can cause severe burns. However, there are certain measures, such as wearing the right protective clothing ,shoes and goggles that can safeguard surgeons and other healthcare workers in theatre from these hazards.

Surgeons experience low back pain higher than other hospital workers. They get involved in bending, awkward static posture during operation plus psychological stress for a long time.Overweight and obesity could be significant risk factors for musculoskeletal pain.Although operation rooms in medical facilities are regarded as the cleanest environments because of surgical sterility requirements, surgical smoke produced by the use of electrocautery is inevitable in modern surgery and potentially harmful to surgical personnel with long-term exposure.In surgical smoke, contaminants such as hydrocarbons, phenols, nitriles, fatty acids, acrylonitrile, and carbon monoxide and viable cellular elements pose potential acute or long-term health hazards to the surgical staff. The electrocautery smoke released during reduction mammoplasty was found to be mutagenic to the TA98 strain by the Ames tests. Airborne particles have consistently been associated with adverse cardiovascular health outcomes. Smoke evacuation in operation rooms has been strongly suggested to minimize exposure and related effects on health. Allergy to topical medications and chemical agents in the working environment such as detergents and disinfectants in the operating room or topical anesthetics and fluorescent agents could be a major distress for the surgeons. Occupational exposure to anesthetic gases have a wide range of health effects, including neurological, renal and hepatic disease, also reduction in mental performance and mental dexterity. It is reported that health care workers who washed their hands >35 times a shift were >4 times more likely to report occupational-related hand dermatitis in comparison to staff who washed less frequently.

Surgeons have to constantly conduct complex procedures under time pressures within a setting plagued with distractions and interruptions while learning new technologies. There is sufficient evidence that excessive stress can impair a surgeon's hand-eye coordination while affecting their non-technical skills of teamwork and decision-making, highlighting the important effects of stress within the human factor in surgery. Stress, fatigue,

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THERANOSTICS IN INDIA :A PARTICULARLY EXQUISITE CONCEPT OR AN EXPERIMENTAL TOOL

INTRODUCTION

In theranostics a diagnostic radionuclide is labelled with the target and once expression is documented, the same target is labelled with a therapeutic radionuclide and the treatment is executed. It signifies the concept of 'we treat what we see and see what we treat'. In Nuclear Medicine, theranostics is easy to apply and understand because of an easy switch from diagnosis to therapy with the same vector.It helps in maximizing tumor dose , sparing normal tissue with high specific and rapid uptake in metastasis with a high effective T1/2 thus delivering high absorbed tumor dose. Imaging and treatment of Neuroendocrine tumors (NET) and prostate cancer (PCa) are current examples of successful implementation of this concept worldwide including RGCIRC and few other institutes in India.

EVOLUTION OF THERANOSTICS IN INDIA

The practice of Theranostics in Oncology made a beginning in 1964 when Radiation Medicine Centre in Mumbai became the first institution to use Radioiodine for the treatment of thyroid cancer by using its 2-3 beds indoor facility. This has now grown to a 16 bed isolation ward and is the largest radionuclide treatment facility in the country having the distinction of treating the maximum number of thyroid cancer cases in the world. This institution has also been treating NET with 177-Luteitium (177-Lu-177) DOTATATE since 2010 and Prostate Cancer with 177-Lu-177 PSMA since 2017. I-131 MIBG therapy for Neuroblastoma and malignant pheochromocytoma are also administered. Although the molecular imaging facilities have showed an exponential growth in the last 5 decades, more so in the last one, the growth of institutions performing radionuclide therapies have not taken place at the same pace. This is mostly due to logistic issues and very stringent regulatory requirements of the Atomic Energy Regulatory Board (AERB) which is the Government of India regulatory body for looking after the radiation safety aspects pertaining to radionuclide therapies. The most prominent among the logistic issues is the requirement of a large capacity delay and decay tank for the effluents from toilets attached to the isolation wards for radionuclide therapy. This requirement has been an infrastructural compliance challenge especially in an already functioning hospital. At the present moment there are 92 isolation wards in the country with a total capacity of about 200+ beds. Our institution has the facility of isolation ward for radionuclide therapy since its inception in 1996 with 3 patient beds.

AVAILABILITY OF INDEGENOUS THERANOSTIC RADIONUCLIDES AND PHARMACEUTICALS

As mentioned earlier the BARC has been involved in the production of radionuclides since the early 1960's and gradually over the years the scientists from different divisions of BARC have developed radiopharmaceutical kits for theranostic use thus benefitting such patients from all over the country as well as few neighboring countries. This has kept pace with the rapid development worldwide.

The practice of theranostics have grown manyfolds in clinical practice in the country in the last 5 years. This has been possible partly due to the availability of radionuclides and radiopharmaceutical kits indigenously as well as importing from overseas at competitive prices. The awareness among clinical oncologists and the patients about this form of treatment has also helped in its sustained growth.

The radionuclides for therapy which are being indigenously available for routine use have been Radioiodine, P-32 and now Luteitium-177 (Lu-177). The use of Lu-177 in the treatment of NET and CRPC is well documented in the world literature now and is now practiced regularly in institutions accredited for performing radionuclide therapy in the country, including ours. In addition to the treatment in these diseases, the indigenously produced Lu-177 have also been used in the palliation of metastatic bone pain . Lu-177 is produced in the BARC reactor by irradiating isotopically enriched Lu_2O_3 target (82% in 176-Lu-176) at a thermal neutron flux of □1X $10^{14} n.cm^{-2}.s^{-1}$ for a period of 21 days. Similarly the isotope division in BARC has developed ready to use freeze dried single vial kit of PSMA-11 and DOTATATE . These have been clinically validated and now used for patient treatment in many institutions.

CURRENT STATUS OF PRACTICE

There has been significant theranostic work done in India both in our institution and other accredited premier institutions in the country. Most of these work has been published and cited in the world literature.

We have shown that initial risk stratification and staging in prostate cancer can be done with 68Ga-68 PSMA as a one stop shop with a reasonably correct N stage estimation and kappa coefficient showing substantial agreement between PSMA PET-CT and histopathological confirmation of lymphnode metastasis (k=0.734).Fair agreement was seen (k=0.277) with T staging. Ga-68 PSMA PET-CT can provide useful incremental information in patients with high PSA and negative TRUS biopsy and has a potential to guide management. Ga-68 PSMA PET CT has been successfully evaluated to assess treatment response in metastatic prostate cancer with biochemical progression undergoing systemic therapy and Lu-177 PSMA ligand therapy. Molecular response evaluation criteria was found to be better in both the studies.

Safety and efficacy of Lu-177 PSMA radio ligand therapy we realso highlighted in a few studies from India. Lu-177 DKFZ PSMA radionuclide therapy was found to be a safe and effective approach in the treatment of mCRPC. In a series of 31 patients with progressive disease despite second-line hormonal therapy and/or docetaxel chemotherapy. The mean activity administered in the 31 patients was 5069±1845 MBq ranging from one to four cycles. There was a decline in the mean serum PSA levels from the baseline. Biochemical response criteria had complete response (CR), partial response(PR), stable disease (SD), and progressive disease (PD), respectively. The mean VASmax score also decreased from 7.5 to 3. The mean analgesic score decreased from 2.5 to 1.8 after therapy. The mean KPS score improved from 50.32 to 65.42 after therapies. The mean ECOG performance status improved from 2.54 to 1.78 after therapy. Two patients experienced grade I and grade II hemoglobin toxicity each. None of the patients experienced nephrotoxicity or hepatotoxicity.

In our series of 25 histologically proven mCRPC patients with progression on standard treatment protocols were administered Lu-177-PSMA therapy on compassionate grounds. All patients were previously treated with at least first line anti-androgens and first line chemotherapy with docetaxel. A Ga-68 PSMA-11 PET-CT was performed on all patients to document adequate receptor expression for inclusion. Our initial results of efficacy and toxicity of one cycle of Lu177-PSMA therapy have showed adequate palliation of pain and PSA response in heavily pre-treated mCRPC patients with low performance status with no clinically significant hematological or other toxicity).

The use of Actinium-225 (Ac-225) labelled PSMA-617 for the treatment of mCRPC is also being performed in one or two institutions in India with promising initial results. Ac-225 is being made available as unit patient dose from overseas and the labelling with PSMA is being carried out in

individual hospital based radiopharmacy. Targeted Alpha therapy with its high level of ionization and short range in tissue has the potential to deliver highly localized cytotoxic radiation to cancer cells with minimal toxicity to surrounding healthy tissues. The commonly used alpha emitting radiotracers used in therapy are Bi-213, Actinium-225 and Astatine- 211. At present there is some initial human experience with Ac-225 DOTANOC, Ac-225 PSMA and Bi-213 DOTATOC. 32 patients of metastatic castration resistant prostate cancer who have failed multiple lines of hormonal therapy, taxane based chemotherapy and other therapies like Abiraterone and Enzalutamide underwent Ac-225 DKFZ-PSMA617 therapy as an end of life salvage therapy. Based on data from Phase I and Phase II studies, an empiric dose of 100kBq/kg body weight was administered every 2 months. The patients were followed with S. PSA levels at the end of 1 month and hematological parameters every two weeks. Clinical performance, QOL scoring and Ga-68 PSMA scan was done before each cycle with a median duration of follow up of 15 months. The median progression free survival was 7.06 months. Median survival from first 225-Ac-225 PSMA treatment was 12.23 months. There was an 81% median PSA reduction. Nearly all the patients including those who did not show PSA response showed improvement in the quality of life. None of the patients demonstrated any serious adverse effect. Xerostomia was the principal adverse effect with nearly 90% of patients showing Gr I and II xerostomia

The results with Ac-225 DOTATOC were even better than the Ac-225 PSMA results. 10 patients of well differentiated NET with evidence of progressive disease following Lu-177 Peptide Receptor Radiopharmaceutical Therapy (PRRT) underwent Ac-225 DOTATOC therapy as a salvage procedure. The average duration of follow up was 15 months. All patients except one showed evidence of partial response to therapy. There was significant improvement of quality of life with no serious toxicity till the time of censure. 5 patients also underwent selective intra arterial Bi-213 DOTATOC infusion with excellent responses.

CONSTRAINTS & POSSIBLE REMEDIES

In India most of the patients pay themselves for their treatments. These high end and new treatment facilities are available in a very few premier public hospitals with subsidized cost.It is therefore imperative that majority of such patients have to be treated in private hospitals at higher cost which many of them are not able to afford. The health insurance industry is still in its developing stage and patients having private health insurance have been gradually increasing over the last couple of years. This is making things easier for the patients having access to it. The availability of indigenously produced radionuclides and radiopharmaceutical kits also contributes to the increasing number of patients availing these new form of treatment. Theranostics for well differentiated thyroid cancer (DTC) with RAI has been well accepted and is being regularly performed in India for remnant ablation, as adjuvant and for treatment of metastatic disease. Use of other theranostic form of treatments are progressing slowly but steadily. We are trying to get over the constraints, increase the indigenous production of radionuclides and kits. We are also looking into the safety profile of these new therapeutic radionuclides in conjunction with AERB with an objective to make these treatments available as a day care procedure so that it could be made available to institutions without the facility of an isolation ward. We are actively participating in disease management groups and tumor boards of individual institutions to increase the awareness among clinicians about the safety and efficacy so that the patients can avail these in the earlier stages of their disease rather than when they are already heavily pretreated with other forms of treatment with both treatment related and 'financial' toxicity.

CONCLUSION

We believe that the theranostic journey in India is on the right track and it is only a matter of time when we will be able to overcome the constraints and put these form of treatment to optimal use in a larger number of patients. We are trying to perfect the art of theranostics and learning new things regularly. Patient selection appears to be a key factor and performance status also plays a very important role in predicting outcome. We expect to perfect this art with more experience as it is believed that 'perfection comes with experience and experience comes with bad judgements.

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Department of Nuclear Medicine

EDITORIAL

emotional distress or anxiety, sleep disturbances, cognitive dysfunction, poor quality-of-life and pain behavior are found to be significant factors involved in musculoskeletal disorders. When performing laparoscopic procedures, the surgeons adopt the standing position which entails the risk of loss of stability. In fact surgeons have limited ability to move their body weight. They must quite often do precise movements by hands while standing only on one leg and use their foot to operate the pedals of laparoscopic devices.

Many occupational necessities and obligations, such as heavy workload and little free time, long-lasting training, costly instruments, early retirement, and the challenge of being up-to-date, could bring about psychosocial problems, such as insomnia, anxiety, depression, amnesia, and chronic headache, for all specialists. Surgeons also face stress in their family relation due to impact of loaded shifts and job stressors. Potential emotional stressors for any female surgeon may include discrimination, lack of role models, role strain, and overload. These stressors can lead to depression, suicide, and divorce, with the rates of suicide and divorce being greater among female surgeons than among the general female public. The risk of health workers becoming addicted to drugs arises because of the stress and anxiety to which they are subjected at times and because of the ready availability of suitable drugs. 32% of surgeons report high levels of job-related exhaustion. Palliative physicians, on the whole, report less stress and more job satisfaction in comparison to their colleagues from gastroenterology, radiology and surgery. Sedentary work and long hours of working, makes them prone to life style diseases like ischemic heart disease, hypertension etc. Lack of exposure to sunlight affects bones, causes deficiency of vit D and predisposes to depression.

Risks because of legal problems and violent patients add to stress. Patients may not have favourable prognosis. But it is common for doctors to be blamed even for naturally poor prognosis of the disease. Legal trouble adds to further stress. Worst part is that our systems are not defined to prevent, treat or compensate or even acknowledge for these big disasters, if it happens to healers. These problems are not known to medical students, when they decide to take medicine, nor they are taught in medical school. Most of the time they have to fend for themselves, if problems occur. Just be careful and be mindful that doctors, nurses, and healthcare workers, may get sickened, injured, disabled, or can be dragged to court or harassed even as they care for their patients in best manner.

Dr. A. K. Dewan
Director - Surgical Oncology

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A TRIBUTE TO AIR VICE MARSHAL H K L KAPUR (RETD)

It will be appropriate to say that Rajiv Gandhi Cancer Institute and Research Centre owes its existence largely to the selfless and tireless efforts of our founder chairman Air Vice Marshal H K L Kapur. A small piece of land at Rohini has been transformed into a premier cancer hospital on the global map.

AVM Kapur was born at Rohtak on December 10, 1923, where his father the Late Rai Bahadur Dr. Ram Chand Kapur was the civil surgeon. After graduating from Forman Christian College, Lahore in 1942 he joined the Indian Air Force. He was promoted to the rank of Air Vice Marshal in 1978. He retired from the service after 37 years of meritorious service and for services of an exceptionally high order rendered to the nation and the Air Force was awarded ***"ATI VISHIST SEVA MEDAL"*** in 1974 and ***"PARAM VISHIST SEVA MEDAL"*** in 1979.

For the Asian Games held at Delhi in November - December, 1982 he was appointed Chief Administrator of the Asian Games Village Complex, to look after the needs and comforts of over 5000 sportsmen and officials. For the efficient and blemish less performance of the important and demanding duties assigned to him, he was awarded "***PADMASHREE"*** in 1983. In early part of 1983 he was also given the responsibility by the then Prime Minister for looking after the delegates from various countries to attend the NAM and CHOGAM, held in India.

In November, 1984 he was nominated to the Rajya Sabha; a distinguished and singular honor to an ex serviceman. He resigned from the membership of Rajya Sabha in November 1985 to take over as ***Lieutenant Governor, Delhi*** an assignment he held till August 1988. Even today, after many years, the average person, irrespective of his position, religion or caste expresses nothing but respect, love and affection.

He had been a source of inspiration to all the consultants and staff of Rajiv Gandhi Cancer Institute and Research Centre. His historic contribution in the inception of RGCIRC is a permanent landmark and will never be forgotten.

May the great soul rest in peace

Members of the Governing Council & management RGCIRC

Architect's Impression of RGCIRC (post expansion)

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