History and Present of Radiation Oncology Services and Practice in Jordan

Rebecca Moore
The Department of radiation oncology at UNC, USA, E-mail: RMoore2@unch.unc.edu

Abstract

Introduction
Jordan is a Middle Eastern country with limited resources and economic constrains. Jordan is divided into twelve governorates that occupy an area of 89,000km with a 2018 estimated population of 10 million [1]. Cancer is the second leading cause of death in Jordan after cardiovascular disease [2]. Cancer care is delivered through a combination of government, non- government, academic and private sectors without any national guidelines concerning treatment protocols or quality assurance. Despite several initiatives, Jordan does not have a national cancer control plan. In countries where cancer control programs have been implemented, the burden of cancer is decreasing and treatment outcomes are improving, supporting the need for Jordan to pursue this strategic goal [3]. In Jordan, the government bears the cost of cancer treatment. Cancer treatment is offered to Jordanians at no cost through government hospitals including the Ministry of Health (MOH), Royal Medical Services (Military), University hospitals and King Hussein Cancer Center, which is a non-governmental facility. Small minority travel for treatment in Europe or USA. According to Jordan Cancer Registry data in 2015, 8400 patients were diagnosed with cancer, 5556 Jordanians and 2844 non-Jordanians [4]. Cancers of the colon were the most common cancers in men and cancers of the breast were the most prevalent among women. It is estimated that 50-60% of cancer patients will need radiotherapy as part of their treatment. The practice of radiotherapy in Jordan has gone through many milestone steps

Literature Review
The first treatment machine in Jordan Jordan's first national hospital was established by a physician named Qasem Malhas in 1945 [5]. A few years later that hospital acquired Jordan's first radiation machine (10-100 Kilovoltage) which was used for treatment of superficial tumors. Radiologists then used to treat with the help of radiology physicists & technologists. No single radiation oncologist was available in Jordan at that time. Doctor Malhas then gifted the Jordanian Ministry of health the machine in 1962. The machine was then transferred to Al-Basheer general hospital which is the main governmental hospital in Amman, the Capital. The hospital used the machine for the management of superficial tumors until the MOH managed to acquire in 1964 an Ortho-voltage machine (300 Kilovoltage, Maxi mar X-ray). At this point Nuclear Medicine specialists along with radiology physicists & technologists began to take part in patient management. A few years later in 1967, the radiology department at the hospital was expanded once more with the arrival of it's and Jordan's first Cobalt machine (1.2 Megavoltage).
The first radiation oncologist in Jordan the MOH had no qualified radiation oncologists until 1974 when the International Atomic Energy Agency (IAEA) hired a Polish Radiation Oncologist to work at Al-Basheer hospital. He contributed to the creation of a separate Radiation oncology department in 1978 and ran the cancer radiotherapy treatment services at the hospital till 1987. The need for graduated and qualified radiation oncologists led to the creation of the first residency program in Jordan. This began in 1987 when the first resident joined the newly created Radiation Oncology residency program at Al-Basheer Hospital. The program is the oldest in Jordan. The program graduates two to three residents every year. Residents attend weekly and monthly lectures and are evaluated annually and at the end of residency by the medical council board exam. By 1987, six new qualified radiation oncologists who spent their residency training abroad in Russia, United Kingdom, and Spain
Current state and challenges of radiation oncology in Jordan Cancer in Jordan has been on the rise steadily in the past 15 years. A 2018 epidemiological study reported a 60% overall increase in the incidence of cancer cases for the period of (2000-2013) [8]. Currently, there are four centers that provide radiation therapy treatment in Jordan. These centers are: (1) Al Basheer hospital, (2) Queen Alia hospital, Royal Medical Services, (3) King Hussein Cancer Center (KHCC), and (4) Al-Afia radiotherapy and nuclear medicine center. A List of the staff and available equipment are presented in Tables 1 and 2. Jordan's total surface area is 89.320 Kilometers putting the coverage per surface area at 22,230 km/center. Unfortunately, all four centers are present in Amman in central Jordan. Amman is home to about 4.2 Million people. This creates a peculiar problem where about 6 Million people of the population of the north and south governorates of the country are not covered and have to travel long hours to receive treatment. Figure 2 shows a map of Jordan. Distributions of Population in Jordan in different governorates are presented.

Future Plans
There has been a growing interest to solve the deficiency in equipment and trained personnel by the Jordanian government, royal medical services, and the private sector. Through increasing financial allocation, charity fundraising, and private sector contributions, radiation oncology has grown as a specialty in Jordan in the past 20 years. The growing need for radiation treatment for different types of malignancies necessitates a greater effort to create new centers with latest state-of-the-art equipment and highly trained radiation oncologists and supporting staff. King

Abdullah University hospital in Irbid (north Jordan) has taken the initiative. A new radiation oncology department will be created there to serve the local population and to increase the machines pool in Jordan overall. The new department will have two linear accelerators, one CT simulator, and one high does rate Brachytherapy unit. Similarly, the existing centers plans to expand and increase its equipment inventory and staffing capacity. KHCC intends to install two new linear acclerators and one MRI based simulator. Al-basheer hospital is expanding into a new building comprising two new linear accelerators capable of Intensity Modulated Radiotherapy and Volumetric arc therapy techniques. Queen Alia hospital will also install a new linear accelerator capable of both techniques.

Conclusion

Jordan, being a developing small country with a low GDP faces a challenge to maintain a viable radiotherapy services. Efforts since 1945 have resulted in an ever growing service with a total of 4 centers. Problems of center distribution and low number of machines are currently the greatest obstacles to overcome. However, we aspire to maintain positively growing interest in providing an affordable and high quality radiotherapy service that is able to serve the Jordanian population and neighboring Arab countries.