CROATIAN MEDICAL JOURNAL
CMJ

43(3):342-345,2002

CASE REPORT

Total Skin Electron Treatment of Extensive Cutaneous Lesions in Kaposi Sarcoma

Damir Margaretić, Dario Faj, Ilijan Tomaš, Branko Dmitrović[1], Zdenko Krajina[2]

Department of Oncology and Radiotherapy, [1]Department of Pathology and Forensic Medicine, Osijek University Hospital, Osijek; and [2]Center for Oncology and Radiotherapy, Zagreb University Hospital Center, Zagreb, Croatia

We report on a 62-year-old HIV-negative male patient with Kaposi sarcoma. After 8 years of treatment of smaller localized skin lesions with surgery and local radiotherapy, the patient developed extensive lesions of the whole skin. The extent of the lesions required the administration of the total skin electron therapy (TSET). Until then, TSET had been used at our Department only for the treatment of mycosis fungoides. The dose delivered was 30 Gy – higher than in a conventional radiotherapy treatment, where doses are usually between 8 and 24 Gy. Six months after the TSET therapy, the lesions completely regressed, except for two large facial lesions, which were surgically removed. Major side effects were mild erythema and hyperpigmentation of the skin. Erythema disappeared a month after the therapy.

Key words: *dose fractionation; radiotherapy dosage; radiotherapy, high-energy; sarcoma, Kaposi; skin neoplasms; whole-body irradiation*

Kaposi sarcoma was initially described as a rare and indolent tumor of elderly Mediterranean men (1). Later it was recognized to occur at higher frequency in Africa (1). It was also found in immunosuppressed organ transplant recipients and as the most common neoplasm in patients with the acquired immunodeficiency syndrome (2). Pathogenesis of the disease and the mechanism of action of its various treatment modalities are still unknown (3).

The most frequently used approaches to treating skin lesions have been irradiation and surgical removal of isolated lesions as they arise (4-6), whereas chemotherapy has been administered for the treatment of more aggressive and extensive forms of disease (6,7). Although there is always a good response of lesions to localized radiotherapy and surgery, new lesions often occur shortly after the treatment (6).

We report on a patient with Kaposi sarcoma treated with localized radiotherapy and surgery for eight years, with progressively shorter relapse intervals and more numerous lesions. We decided to treat the patient using a modified method, the total skin electron treatment, applied previously at our Department only for the treatment of mycosis fungoides (8).

Case Report

A 62-year-old man was diagnosed with Kaposi sarcoma in 1996. Since 1992, he had been treated at the Virovitica Medical Center (Virovitica, Croatia) for skin lesions on the ear, face, and nose. The lesions had been surgically removed and diagnosed as fibroma inflammatum, dermatofibroma, and hemangioma capillare, respectively. Reconsideration of the lesion tissue samples in 2001 showed that all histological pictures were typical for Kaposi sarcoma.

In 1996, at the University Hospital Osijek, the patient underwent excision of two tumor lesions from the right nostril, each 0.5 cm in diameter. The lesions were recognized as Kaposi sarcoma, and the diagnosis was confirmed by immunohistochemical tests. The tumor consisted of relatively homogeneous, spindle-shaped cells, with rather long and oval nuclei and eosinophilic, vaguely marked cytoplasm. Tumor cells formed interwoven bundles, intersected by numerous slit-like blood veins containing erythrocytes. The endothelium of blood veins was factor VIII-positive, whereas tumor cells were negative (Fig. 1).

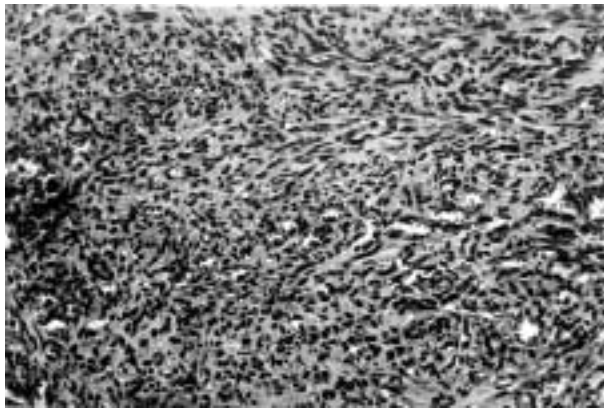

Figure 1. Patient with extensive Kaposi sarcoma. Biopsy specimen of the tumor in the right nasal cavity, diagnosed as Kaposi sarcoma. Hematoxylin-eosin (x200).

Later that year (1996), the simultaneous presence of separate 5 mm diameter lesions on both ears and lower legs was observed, and the patient was serologically tested for HIV-1 and HIV-2. The results were negative. The patient's both legs were irradiated (18 Gy/6 fr) and the treatment resulted in clinical regression. Lesions on the nose, face, and shoulders were irradiated locally several times during the following two years. By the end of 1999, the tumor had relapsed on the chin and lower left eyelid. The lesions were surgically removed. The next relapse was in June 2000, in the form of multiple lesions all over the body (Fig. 2). Because of numerous skin lesions and accompanying edema of both feet, the patient could not walk without difficulties and pain. Painful lesions and edema also caused limited movement of his fingers.

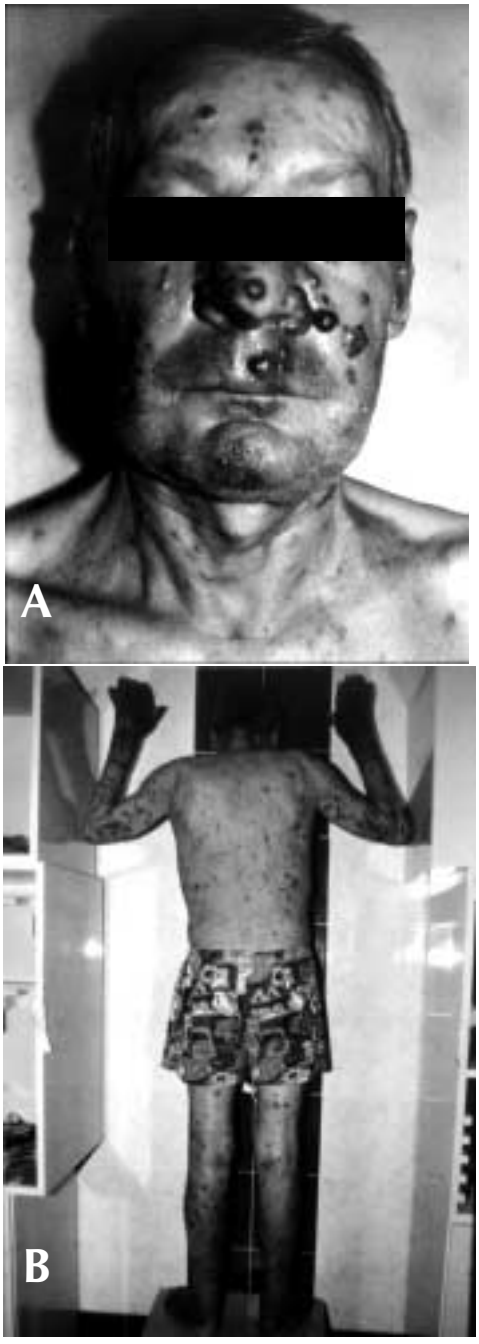

Figure 2. Patient with extensive Kaposi sarcoma. **A.** The patient's face before total skin electron therapy. Nodules of different size, up to 3x2 cm on the left nostril and upper half of the left auricle. The lesions were up to 1 cm above the skin level. **B.** The patient in one of the therapy positions before total skin electron therapy. Multiple lesions of the trunk, arms, and legs measured up to 2 cm in diameter, confluence sporadically, and protruded up to 1 cm above the skin level. Informed consent was obtained from the patient for these photographs.

The dissemination of the disease to other organs and body parts was excluded by ultrasound and X-ray examinations. Routine hematological and biochemical findings were normal.

At our institution, we use Siemens Mevatron MD2 linear accelerator, with six dual angled fields at "source-to-skin" distance of 3.5 m for radiotherapy of the whole skin (total skin electron therapy). Although the eight-field technique, or the rotational technique, shows a somewhat better dose uniformity over the body, the six-field technique is simpler, less time-consuming, and of a quite satisfactory dose uniformity (9). The patients are treated in the standard position every other day (9). Large "source-to-skin" distance ensures a large enough field to cover the patient's width and, by combining two fields, to cover the patient's height. Since X-ray contamination is the largest at the central axis of the beam, the axes are directed just above the head and to the feet to avoid large dose to the whole body.

Panel made of clear Lucite was placed in front of our patient at a distance of 20 cm to degrade energy of electron beams. The depth dose curve was satisfactory (Fig. 3). To be sure that suitable depth of dose distribution and homogeneity all around the patient were achieved, film dosimetry in a cylindrical Lucite phantom was performed. A film sandwiched in the phantom was exposed to all six dual beams under the treatment conditions. Film densitometry showed satisfactory dose uniformity around the patient. How-

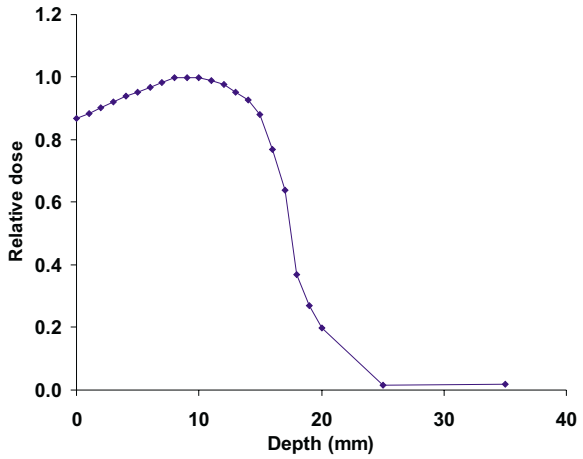

Figure 3. In total skin electron therapy of the patient with extensive Kaposi sarcoma, depth dose curve of a single horizontal 8 MeV electron beam was degraded to desired 4 MeV by electron scattering in air and 0.5 cm thick Lucite panel.

ever, the shift of the depth dose curve towards the skin surface caused by the oblique incidence of many electrons was observed and accounted for. X-ray contamination was also measured and found to be around 3% (≈1 Gy) for all six dual beams, which was within desirable limits (9).

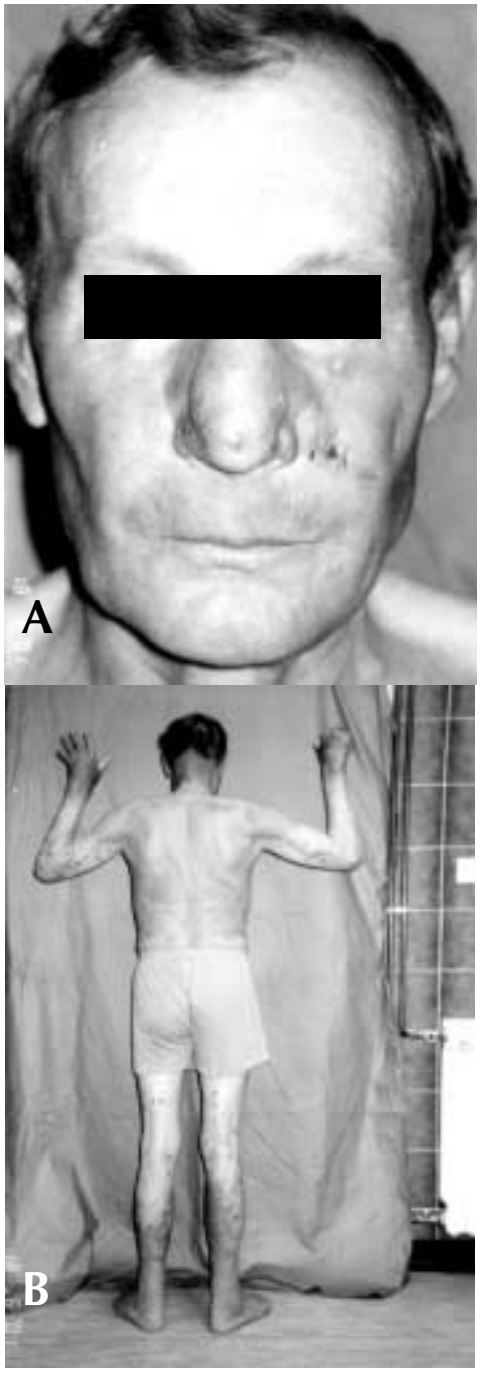

Figure 4. Patient with extensive Kaposi sarcoma after total skin electron therapy. **A.** The remaining lesions on the eyelid and left cheek were surgically removed. Other lesions on the face disappeared without intervention. **B.** The patient in the therapy position, after the therapy. The nodules regressed to the skin level, but remained hyperpigmented. Informed consent was obtained from the patient for these photographs.

The self-shielded areas receiving insufficient radiation dosage, such as the perineum, soles of the feet, and vertex of the scalp, were irradiated with small fields using 5-10 MeV electron beams to ensure that proper dose is achieved for the whole skin.

Since early vascular nodules and macules are generally more radiosensitive than the older infiltrated plaques, we adjusted the fractionation and dose to the patient with extremely large Kaposi sarcoma skin lesions over the whole skin. The total dose delivered was 30 Gy in 10 weeks, 1 Gy per day, shielding only the eye lenses.

During the total skin electron therapy, we monitored size of the lesions, reduction of pain, motility of the patient, complete blood count, hair status, and acute reactions of the skin (skin color and pigmentation, pruritus, desquamation, and bulla formation).

After completing the treatment, patient was monitored in two-month intervals for the evaluation of response, and acute and late radiation changes. The skin was regularly photographed.

During the treatment, Kaposi sarcoma lesions gradually regressed. After four fractions, the pain in the feet ceased. After 20 Gy were delivered, a mild erythema of the skin was noticed, as well as hemorrhagic bulla on the right big toe. The bulla was surgically removed and this operation caused a 10-day treatment pause. By the end of the therapy, the plagues regressed by 70%. Erythema disappeared a month later. The following checkups confirmed gradual regression of lesions. The function of the feet was normal, edema was notably smaller, and the finger function improved. Six months later, there were only two tumorous lesions of 0.5 cm above the facial skin level, and hyperpigmented lesions at the skin level (Fig. 4). The biopsy of a hyperpigmented lesion on the forearm, persisting after the nodule had diminished, did not show features of Kaposi sarcoma but degenerative mutations of collagen fibers, with scattered siderophages and rare mononuclear inflammatory cells (Fig. 5).

Two lesions on the patient's face, although having greatly regressed, did not disappear and were surgically excised (Fig. 4a). The biopsy of the tumor of

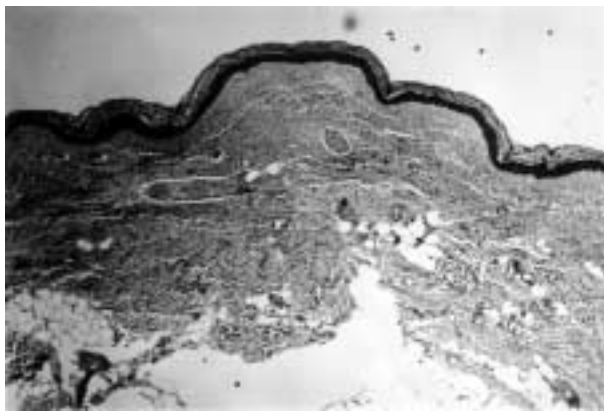

Figure 5. Patient with extensive Kaposi sarcoma. Biopsy specimen of the tumor on the right forearm, with no trace of the Kaposi sarcoma. Hematoxylin-eosin (x25).

0.6 cm in diameter on the left lower eyelid and the 0.4-cm-diameter tumor of the left facial side revealed Kaposi sarcoma. There was no sign of notable histological progression of the lesions compared with the findings in 1996 and 1993. The mild and dry desquamation of the large part of the skin also disappeared eight months after the total skin electron therapy. The patient had grayish hair that thinned out during the therapy. Nine months later his hair was brown again and adequately thick. Sixteen months after the therapy the patient's condition remained unchanged.

Discussion

We presented a case of a patient with classical Kaposi sarcoma limited to the skin. After a long period of repeated localized radiotherapy treatments and numerous surgeries of skin lesions, the disease spread over the whole skin and made the localized treatment approach impossible. The extent of skin disease required total skin electron therapy, which yielded satisfactory results with only mild side effects.

An important limitation of the total skin electron therapy is that the beam penetration depth is the same for the whole skin and cannot be changed and adjusted, whereas the local therapy allows the adjustment of the depth in proportion with the size of a lesion. According to the dominant lesion size, the chosen depth was 1.5 cm – inadequate for the two larger facial lesions, which remained after the therapy and had to be surgically removed.

Localized therapy usually delivers the dose between 8 and 24 Gy (1,4,6). To the best of our knowledge, there is only a single report on the total skin electron therapy in patients with Kaposi sarcoma (10). The reported dose ranged from 24 to 32 Gy in weekly 4 Gy fractions.

The severity of the radiation dermatitis depends on the radiation dose and the period of time over which the dose was delivered (11). Since early vascular nodules and macules are more radiosensitive than the older infiltrated plaques, we assumed that a large dose had to be delivered. Taking into account the size of lesions and their regression during the irradiation, 30 Gy proved to be sufficient.

Based on our previous experience with total skin electron therapy in patients with mycosis fungoides, we chose the fractionation of 1 Gy a day, 4 times a week, to minimize possible acute and late radiation changes. The radiation side effects were manageable. Since there is still no causative treatment for Kaposi sarcoma, the irradiation treatment remains only a palliative approach and eventual re-treatments are possible.

Our case report showed that, although the total skin electron therapy is very demanding mode of treatment for the entire radiotherapy team, it is also very effective and safe even in a case of very extensive skin lesions in Kaposi sarcoma.

References

1 Cooper JS. Classic and acquired immunodeficiency syndrome (AIDS) – related Kaposi's sarcoma. In: Perez CA, Brady LW, editors. Principles and practice of radiation oncology. Philadelphia (PA): Lippincott – Raven Publishers; 1998. p. 745-59.

2 Iscovich J, Boffetta P, Franceschi S, Azizi E, Sarid R. Classic Kaposi sarcoma: epidemiology and risk factors. Cancer 2000;88:500-17.

3 Chang Y, Cesarman E, Pessin MS, Lee F, Culpepper J, Knowles DM, et al. Identification of herpesvirus – like DNA sequences in AIDS-associated Kaposi's sarcoma. Science 1994;266:1865-9.

4 Tombolini V, Osti MF, Bonanni A, Valeriani M, Iacari W, Donato V, et al. Radiotherapy in classic Kaposi's sarcoma (CKS): experience of the Institute of Radiology of University "La Sapienza" of Rome. Anticancer Res 1999;19:4539-44.

5 O'Brien P, Brasfield R. Kaposi's sarcoma. Cancer 1966; 19:1497-502.

6 Tur E, Brenner S. Treatment of Kaposi's sarcoma. Arch Dermatol 1996;132:327-31.

7 Vogel CL, Primack A, Dhru D, Birers P, Owor R, Kyalwazi SK. Treatment of Kaposi's sarcoma with a combination of actinomycin D and vincristine. Results of a randomised clinical trial. Cancer 1973;31:1382-91.

8 Faj D, Krajina Z, Bistrović M, Gugić D, Margaretić D, Belaj N, et al. In-air dosimetry characteristics of the total skin electron therapy implemented at the University Hospital Osijek radiotherapy department. Libri Oncologici 2001;29:17-20.

9 American Association of Physicists in Medicine. Total skin electron therapy technique and dosimetry. Report No. 23. New York (NY): American Institute of Physics; 1988.

10 Nisce LZ, Safai B, Poussin-Rosillo H. Once weekly total and subtotal skin electron beam therapy for Kaposi's sarcoma. Cancer 1981;47:640-4.

11 Price NM. Radiation dermatitis following electron beam therapy. An evaluation of patients ten years after total skin irradiation for mycosis fungoides. Arch Dermatol 1978;114:63-6.

Received: March 3, 2002
Accepted: May 6, 2002

Correspondence to:
Damir Margaretić
Radiotherapy and Oncology Department
University Hospital Osijek
J. Huttlera 4
31000 Osijek, Croatia
margaretic.damir@kbo.hr