Teaching Case

Long-term benefit of electron beam radiation therapy in the treatment of scleredema of Buschke

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Abstract
Introduction: Scleredema of Buschke is a rare connective tissue disorder presenting with woody thickening and induration of the nuchal and shoulder regions resulting in progressive decrease in the range of motion of the neck. Treatment options include several forms of systemic therapy with variable results. Local radiation therapy (RT) is often thought of as a secondary form of therapy. Few reports exist in the literature about the durability of its benefit, however. Here, we present a case report with the longest known follow-up after primary treatment with electron beam RT.

Methods: The patient was treated using 8-MeV en face electrons with 2000 cGy in 10 fractions with 2 separate but matched electron fields. The treatment fields included the posterior neck from the occiput superiorly to the mid-thoracic spine inferiorly with the lateral borders extending to the scapulae. The patient received no additional therapy either pre- or post-RT. Clinical follow-up was obtained at regular intervals. Published literature regarding RT for this disease was reviewed and consolidated.

Results: The patient was followed at regular intervals for 6 years with significant softening of the plaque starting at 2 months after RT, resulting in decrease in plaque size by 50% after 18 months. The patient regained 45° of lateral, bidirectional cervical motion from central axis and 50% improvement in neck extension that has remained durable 6 years after treatment with no additional therapy. Quality of life was restored with a simple nontoxic treatment limited to transient, grade 1 fatigue.

Conclusion: Scleredema of Buschke is a rare connective tissue disorder commonly treated with multimodal therapy, but it can be effectively and durably controlled with RT alone. This case report documents the durability of the benefit achieved with RT and suggests that RT should be considered earlier in the treatment of this disease.

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Introduction

Scleredema of Buschke is a rare connective tissue disease characterized by increased dermal thickness and indurated erythematous plaques of the neck, a condition that usually spreads inferiorly and symmetrically over the shoulder region while sparing distal extremities.1-7 The condition causes decreased range of motion, decreased sensation, pain, and poor cosmesis, which then prompts the workup; in rare cases, constrictive cardiopulmonary distress is the most severe outcome.8-10 Differential considerations include systemic sclerosis, scleromyxoedema and dermatomyositis.

Three recognized types of scleredema exist: classic, slowly progressive, and diabetic-associated, also known as scleredema diabeticorum or scleredema adultorum. This eponym is based on the 2.5% prevalence of indurated plaques in poorly controlled adult diabetics.11-14 Pathogenesis of scleredema diabeticorum involves increased collagen glycosylation resulting in excess cross-linking, rendering fibers resistant to degradation and ultimately increasing dermal thickness.15 Histopathology shows abnormal mucin accumulation in the reticular dermis and dermal collagen fiber scerosis. In the acute setting, histopathologically, collagen fibers are separated by hyaluronic acid, whereas collagen bundles are separated by the mucopolysaccharides.15,22

Excess mucin deposition is governed by fibroblast activity, which is presumably reduced by radiation.19,20 Several mechanisms of action have been proposed, including dermal fibroblast suppression, fibroblast cell signaling interference, and apoptosis induction.6,16 Radiation-induced atrophy is not a likely mechanism because this effect typically occurs with much higher doses of radiation than those used for scleredema. Electrons are typically used for cutaneous disease because they effectively treat superficial targets with limited or no deep tissue penetration.

Many systemic treatments, including bath-psoralen ultraviolet A, cyclosporine, methotrexate, extracorporeal photopheresis, prednisolone, thyroid hormones, pituitary extract, physiotherapy, hyaluronidase, frequency modulated electromagnetic neural stimulation, and high-dose penicillin have been used with variable results.4-6,12,14,17

| Author, y | No. of patients | Prior treatment | Energy | Dose | Outcome | Follow-up |
|-----------|----------------|----------------|--------|------|---------|-----------|
| Angeli-Besson et al., 1994 | 1 | Prednisolone, factor XIII, cyclofenil | 7-MeV electrons | 20 Gy/10 fx | Sustained PR | Not reported |
| Tamburin et al., 1998 | 1 | Topical, intralesional, systemic corticosteroids | Electrons | 20 Gy/10 fx | PR 6 wk | 2 y |
| Tobler et al., 2000 | 2 | Prednisolone | Mixed 12-MeV electrons and 6-MV photons | 20 Gy/10 fx | PR | 7 mo |
| Lee MW et al., 2000 | 3 | Not reported | Electrons | 24 Gy/12 fx | CR-PR | 7 mo |
| Bowen et al., 2003 | 3 | Unspecified systemic treatments | Photons 6 MV and electrons 9-16 MeV | 20 Gy/10 fx (18-21.6 Gy/1.8-2.0 Gy) | 3 initial PR, waning effects at 1-2 y 1 reirradiation at 1 y | Not reported 2.5 years |
| Konemann et al., 2004 | 1 | Penicillin, psoralen ultraviolet A | 9-MeV electrons | 20 Gy/10 fx, reirradiation with 20 Gy/10 fx | PR reirradiation required | 16 mo |
| Current paper, 2015 | 1 | None | 8-MeV electrons | 20 Gy/10 fx | PR in range of motion, CR in plaque induration | 6 y |

CR, complete response; fx, fraction; PR, partial response.
Radiation therapy (RT), an effective, established treatment modality in several cutaneous diseases, has also been used in refractory scleroderma, although it has not been reported as a sole treatment. Several case reports demonstrate RT benefits in medically refractory scleroderma (Table 1). However, there is no consensus on optimal dose. Several authors recommend 20 Gy in 10 fractions using 7 to 9 MeV electrons and they reported excellent, sustained clinical improvement. Others have used higher energy electrons because of the dermal rind thickness, with minimal toxicity and marked improvement in range of motion.

Here we present a patient successfully treated with RT alone and followed for 6 years.

Case Report

The patient is a 72-year-old Caucasian male with extensive cardiovascular history, obesity, and poorly controlled diabetes mellitus. The patient’s dermatological history includes basal cell carcinoma, seborrheic dermatitis, rosacea, and lipodermatosclerosis. He presented to the radiation oncology clinic for evaluation of decreased neck extension and range of motion (ROM) 3 years after having been diagnosed with scleroderma diabeticorum. No prior treatment was delivered because he was asymptomatic and declined systemic intervention. At initial evaluation, a very thickened plaque overlying the posterior neck and upper back with limitation of neck extension and flexion of 10 to 15° and secondary shoulder kyphosis was observed. No limitation to shoulder or arm ROM was present. Lateral neck ROM was limited to 5 to 10° degrees from center. The patient sought treatment because of a decreased quality of life from the decreased ROM of his neck.

Methods and Materials

The patient underwent computed tomography simulation to measure the depth of subcutaneous tissue involvement, ~0.75 cm. At clinical simulation, he was positioned prone on the LINAC treatment table with arms reaching anteriorly above his head. He received 8-MeV en face electrons dosed to the 90% isodose line to cover the deepest extent of the lesion with 2 matched fields at the base of the posterior neck, 1 covering the neck and the other between the shoulders corresponding to palpable plaque with minimal margin. Field borders were the occiput superiorly, mid-thoracic spine inferiorly, and to within 4 cm of his shoulder blades laterally (Figure 1A, B). Within the fields, a 1-cm bolus was placed on the skin to achieve full electronic equilibrium. He received 20 Gy in 10 daily fractions based on the published literature.

Results

At the 2-month follow-up, we observed significant plaque softening. By 6 months, significant decrease in plaque size was noted but was <50%. At 18 months, plaque size and induration decreased >50% with resolution of secondary shoulder kyphosis and stable shoulder ROM. At 21 and 29 months, neck extension, edema, and induration continued to improve, though with decreased velocity. The final follow-up at 6 years showed no evidence of residual plaque (Fig 2). In summary, the lateral ROM for his neck increased from 10 to 15° pre-RT to 45° from central axis post-RT, whereas flexion/extension improved from 10 to 15° to 20 to 30°. This improvement was most evident over the first 3 years post-RT and was clinically estimated (Fig 3). Over the latter 3 years, the patient reported stabilization and perhaps subtle improvement of the condition associated with significant quality of life improvement such as driving with relative
ease. Acute toxicity was limited to grade 1 erythema and fatigue, which resolved within 1 month.

Discussion

Scleredema diabeticorum is a rare cutaneous disease causing the formation of indurated plaques in the neck and upper back, typically seen in adult men with poorly controlled diabetes. Diagnosis can be challenging, and systemic treatment options are heterogeneous. RT is typically offered late and administered concurrently with systemic treatments, making it difficult to attribute improvements to RT. Brisk benefits have been reported in as little as 6 weeks; however, it is unclear if benefits are due to treatment synergy or RT.

The case presented here is unusual given a 3-year interval between diagnosis and intervention as well as the use of RT as the sole mode of treatment. Response was durable and progressive over time. RT was also convenient, brief, noninvasive, and well-tolerated. Risk of secondary malignancy in this age group is minimal. We therefore suggest consideration of RT for limited disease as a primary therapy for the treatment of the adult form of scleredema diabeticorum. Because incidence of obesity and diabetes continues to rise, the incidence of this disease/condition may also rise, necessitating a greater awareness of treatment options by clinicians.

Conclusion

Scleredema diabeticorum is a benign condition characterized by indurated plaques in the upper back and neck, causing significant morbidity and limitation in quality of life. Treatment with multiple systemic therapies before RT is commonplace despite the noninvasive, efficient, and effective nature of RT. The case presented here confirms the efficacy of previously reported doses of RT and supports its use as the only method of treatment. The benefits in increased range of motion appear to be long-lasting, suggesting that RT should be considered as a primary method of treatment in cases of adult scleredema diabeticorum.

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