e-ISSN 2083–4640
ISSN 1507–1367

REVIEW ARTICLE

Reports of Practical Oncology and Radiotherapy
2022, Volume 27, Number 5, pages: 914–926
DOI: 10.5603/RPOR.a2022.0101
Submitted: 03.07.2022
Accepted: 04.08.2022

Mexican radiationdermatitis management consensus

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ABSTRACT

Background: Radiotherapy (RT) is an essential element in cancer treatment: 50–70% of cancer patients receive RT at some time of the course of their disease. Of these, almost 95% experience some grade of radiation dermatitis (RD). RD can affect patient's quality of life during and after treatment. Consequently, the management of RD is important. There are few randomized controlled clinical trials on interventions used to prevent and treat RD and no standardized consensus on RD management. A panel of opinion leaders of the Mexican Society of Radiotherapy (SOMERA) took part in a study of oncologic practice in Mexico. The following clinical guide is referenced both by the national practice reality and international evidence.

Materials and methods: This RD management guide is based on input provided by 25 Mexican radiation oncologists, whose criteria were gathered using the Delphi Method and article review.

Results: Twenty-one questions about experience in RD treatment were voted. More than 80% of the panel agreed with: the use of dermocosmetics/medical device in prevention and in treatment of RD grades 1–2. As for grade 3, they recommend individualizing each case and dermatologist evaluation. Topical steroids should be used when there is skin itching or pain. Consider the use of natural soaking elements. Skin care must be continued to avoid or reduce severity of late radiation skin lesions.

Conclusion: This consensus was developed as a supportive educational tool that can be adapted to individual clinical needs, useful for professionals involved in the treatment of RT patients.

Key words: radiotherapy; radiation dermatitis; guidelines; toxicity

Rep Pract Oncol Radiother 2022;27(5):914–926

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Introduction

Radiotherapy (RT) is an essential element in the treatment of cancer. Around 50–70% of cancer patients receive RT at some point of the course of their disease. Of these, almost 95% experience some form of skin lesion induced by radiation. Radiation Dermatitis (RD) refers to a group of skin changes that result from the combination of RT characteristics and intrinsic risk factors of the patients. RD can affect the patient's quality of life during and after treatment. Consequently, the management of radiation-induced skin lesions is an important aspect of cancer treatment.[1] Internationally, there is a great variety of topical treatments that are used to prevent and treat RD, often with little or no evidence base. For this reason, there is no standardized consensus on RD management [2–5].

Our guide for the management of RD in Mexico is based on input provided by Mexican physicians with experience in radiotherapy, whose criteria were gathered using the Delphi Method and based on published national and international evidence.

Radiation dermatitis is a group of skin lesions that appear after exposure of the skin to ionizing radiation [6]. Such changes depend on intrinsic and extrinsic factors [4, 14, 15]. There is an acute and a chronic form [7]. Up to 90% of patients having undergone RT have experienced any RD grade [2, 5, 9]. It is more frequent in patients that received RT of the breast and concurrent chemotherapy for cancer of the head and neck [9]. Late damage from radiation appears in up to 15% of cases [10]. For the RD assessment the scale recommended by different guidelines is that developed by the Radiation Therapy Oncology Group (RTOG) [4, 7, 14, 15].

The cutaneous damage is observed 10 to 14 days after the first fraction [11]. The seriousness of skin reactions can increase 7 to 10 days after ending RT. This period is known as the maximum adverse "peak". Four to six weeks after RT, the skin should begin to heal with some pigmentation changes on the radiated area (Fig. 1).

Physicians frequently explain to their patients that the radiation will produce a "burn" to convey the understanding of RT's effects on the skin. However, it must be made clear that this is not a burn (Tab. 1). As is known, the frequency and severity of RD can be predicted considering certain predisposing factors (Tab. 2, 3) [15].

The process of evaluating the skin

Integral care of the patient should begin with a general questionnaire (Supplementary File — Annex 2).

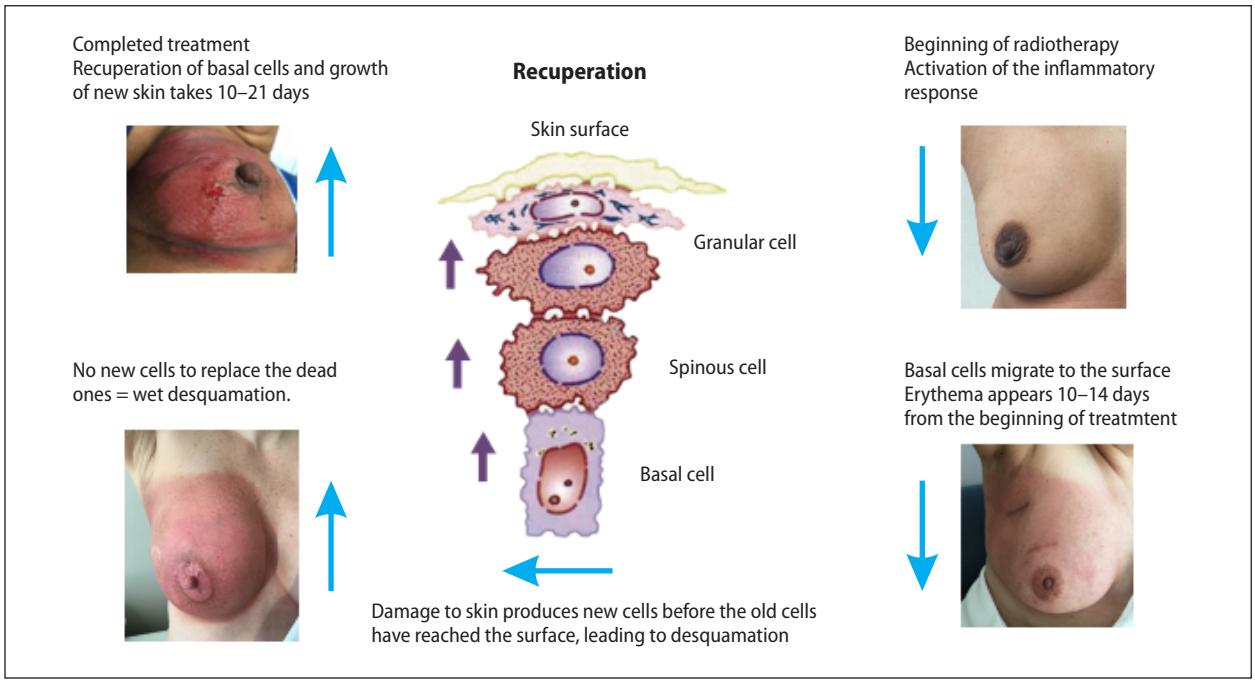
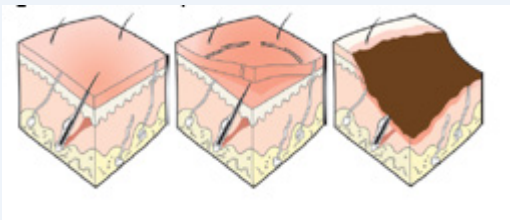


Figure 1. Cycle of clinical manifestations of radiation dermatitis along with cellular replacement

Table 1. Differences between lesions caused by burns and those induced by radiation therapy (RT) [4]

Skin lesions	Radiation dermatitis	Burn
Cause	The absorption of the ionizing radiation affects the regeneration process	Traumatic: fire, liquids, hot objects, frozen objects, corrosive substances, electricity, and ultraviolet light
Time of appearance of reaction	Delayed (days)	Immediate (minutes)
Affected skin layers	Only the epidermis layers	All of the layers in descending order from the epidermis to the muscles, tendons and bones
Sequence of damage	The damaged basal cells migrate to the surface of the skin 	Damage occurs in descending order, through all the layers of the skin, in relation to the degree of the burn 

The management of burns is different from that of the reactions produced by radiotherapy. Understanding the differences is fundamental for implementing the correct interventions [4]

Table 2. Intrinsic factors related to the severity of radiation dermatitis (RD) [4, 10]

Age	The natural ageing process affects the epidermal cellular cycle, resulting in delay of wound healing.
Nutrition	An adequate nutritional intake is necessary for the optimal repair of tissue damage.
Smoking and alcohol consumption	Other habits can reduce capillary blood flow, which delay tissue repair and can increase the risk of infection.
Comorbidities	Other illnesses and some medications can increase the risk and the intensity of the cutaneous reactions and affect the healing process. Examples: diabetes mellitus, immunodepression, lupus, scleroderma, treatment with steroids.
Ethnic exposure to ultraviolet radiation (UV)	Patients with prolonged exposure to UV rays may experience more serious RD and deterioration of wound healing. Worse evolution of skin reactions has been reported in patients with darker skin than in those of lighter skin.
Obesity	Excess adipose tissue may compromise wound healing and exacerbate cutaneous toxicity due to additional skin folds or areas where there is natural skin folding.
Infection	The presence of bacterial and/or fungal infection can damage the cells of the basal layer and delay healing.
Genetic affectation	Illnesses that compromise the integrity and regeneration of DNA. For example: ataxia telangiectasia, xeroderma pigmentosum, Gorlin-Goltz syndrome, Bloom syndrome and Fanconi's anemia.

Table 3. Extrinsic factors related to the severity of radiationdermatitis (RD) [4, 10, 15]

RT	Higher doses, use of *bolus*, large fields and volumes Various schemes of treatment can be associated with an increase in toxicity by RT Gamma rays, X-rays and neutron beams carry a greater risk and are associated with radiation-induced cutaneous damage Intensity Modulated Radiotherapy Technique (IMRT) can reduce the severity of the cutaneous reaction
Energy of the RT	The greater the energy, the less the skin reaction
Radio sensitizers	Some chemotherapy agents are radio sensitizers. Examples: 5-fluouracil, mitomycin C, cisplatin, immunotherapy
Chemical, thermal, mechanical irritants	Irritants can exacerbate the skin reaction and delay the healing process. Examples: — Chemical products, such as deodorants, perfumes, talcum powder and creams that contain metals — Changes in temperature, such as hot water bottles or ice — Friction, such as rubbing the skin or wearing tight clothing

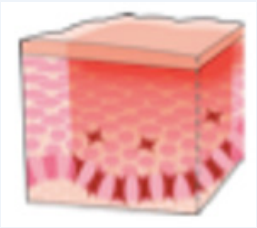
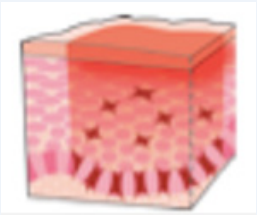
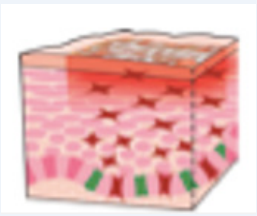
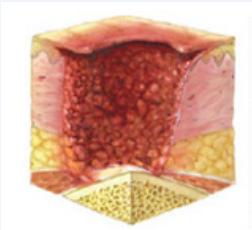
RT — radiation therapy

Predicting the severity of cutaneous lesions might be difficult due to variations of radiosensitivity of the skin and to a series of contributing factors (Supplementary File — Annex 3). Both intrinsic and extrinsic factors can significantly increase the seriousness of RD and delay the healing process. The Fitzpatrick Classification of phototype of the skin is used to estimate the minimum erythema dose (MED). It has been shown that the Fitzpatrick I–III skin types have a lower MED in comparison with types IV–VI [16].

Adequate evaluation of the skin is essential to guarantee proper timely management in order not to compromise the healing process [4].

The use of a tool to quantify the intensity of RD is recommended, the scale that is most frequently used to evaluate the degree of RD is the RTOG (Radio Therapy Oncology Group). (Tab. 4).

Table 4. Radiation Therapy Oncology Group (RTOG) Classification System [4]

Evaluation/Observation		Effects of RT on the cells of the skin	Treatment according to severity
	**RTOG 0** No visible changes of the skin		General recommendations Supportive education Begin topical moisturizers
	**RTOG 1** Slight erythema. May produce slight tension and pruritus		General recommendations Promote hydration of the skin Treat pruritus and irritation
	**RTOG 2** Bright erythema/dry desquamation Sore, tense skin, with pruritus		General recommendations Promote hydration of the skin Treat pruritus and irritation Reduce pain
	**RTOG 3** Confluent moist desquamation. Pale yellow/green exudate. Pain with edema		Same as RTOG 2 Do not apply moisturizer or topical steroids on skin that is not intact Apply drying compresses on areas of moist desquamation Cover the moist descamation areas with apropriate bandage/dressing Consult with a dermatology specialist
	**RTOG 4** Ulceration, bleeding, necrosis (rarely seen)		Multidisciplinary focus Interrupt RT Surgical debridement Use of skin grafts or pedicle flaps

RT — radiation therapy

Management of radiation dermatitis

The objectives of the prevention, treatment and general recommendations of RD [4, 5] is listed in the Card with General Recommendations (Supplementary File — Annex 1).

Radiation oncologists usually avoid the use of topical agents immediately before radiation sessions to avoid the *bolus* effect. However, in a dosimetry and preclinical study, there was no difference on the surface of the radiated skin with or without a 1–2 mm thick layer of topical agents metallic or non-metallic, regardless of the energy or the incidence of the beam. On the other hand, it has been shown that when thick layers are applied, the superficial dose is increased [9].

Recommendations before and after radiotherapy:

- maintain the integrity and hydration of the skin;
- reduce the factors that might potentiate or exacerbate a skin reaction;
- promote comfort and acceptance;
- avoid or reduce pain, burning, itching, stinging, or pruritus;
- protect from possible trauma;
- prevent infections;
- promote healing of moist lesions;
- control bleeding, bad odor and excessive exudate from an ulcerated or fungal lesion in the sites of rt administration.

Recommendations after radiotherapy:

- the severity of RD can increase between days 7 and 10 after finalizing RT;
- at 4 to 6 weeks after concluding RT, skin should improve significantly or be completely healed;
- the justification for interventions in the care of the skin after RT is the same as that indicated during the treatment: therapeutic interventions should coincide with continued evaluation of the changes in the skin and in the RTOG scale;
- as part of the normal reaction to RT, a yellow/green exudate can accumulate around moist desquamation. This exudate should not be removed (unless the amount is excessive) because it aids in the healing process and contributes to pain relief since it prevents the exposure of the nerve endings of the moist desquamation area.

Additional recommendations [4]:

- continue usual habits of cleaning with non-perfumed soaps and other products;
- dry the skin with a soft towel and with blotting rather than rubbing;
- do not use perfumes, deodorants, talcum powders, creams or gels on the area being treated without the consent of the attending physician;
- maintain the levels of hydration and integrity of the skin;
- wear loose clothing to avoid friction;
- avoid exposing the skin to the sun until the lesions have healed and then use a sunscreen with a high protective factor (SPF 30+) since radiated skin remains more sensitive;
- avoid swimming in chlorinated water until the skin reaction has healed completely;
- avoid applying extreme temperatures to the skin, such as hot water or ice packs;
- shaving with moisturizers should not be done, nor should depilatory chemical hair removal products be used. Electric shavers are more adequate.

Guide for the treatment of RD according to severity

Most of the previously listed measures are directed toward preventing lesions, limiting their severity and lessening the symptoms. Once RD has begun, treatment is indicated according to the severity of the situation while maintaining the recommendations for prevention (Tab. 4, Fig. 2) [18].

Adequate hydration improves the barrier function of the skin, reduces pruritus, burning, stinging, and prevents infection secondary to scratching. In this way, skin reactions can be prevented and controlled before, during and after RT. Different moisturizing agents are classified as dermocosmetics and medical devices.

Dermocosmetics are non-pharmacological products used in personal hygiene, and in the cleaning, hydration, and photoprotection of the skin [19]. The catalog for the dermocosmetics can be found in the listed reference (Annex 4, 6–7) [20]. The main components of the dermocosmetics used in RD are:

- collagen: protein that provides softness and firmness [20];
- hyaluronic acid: natural substance that greatly attracts and traps water, maintaining the skin hydrated, soft and smooth. It has been shown *in vitro* that it protects fibroblasts from damage by

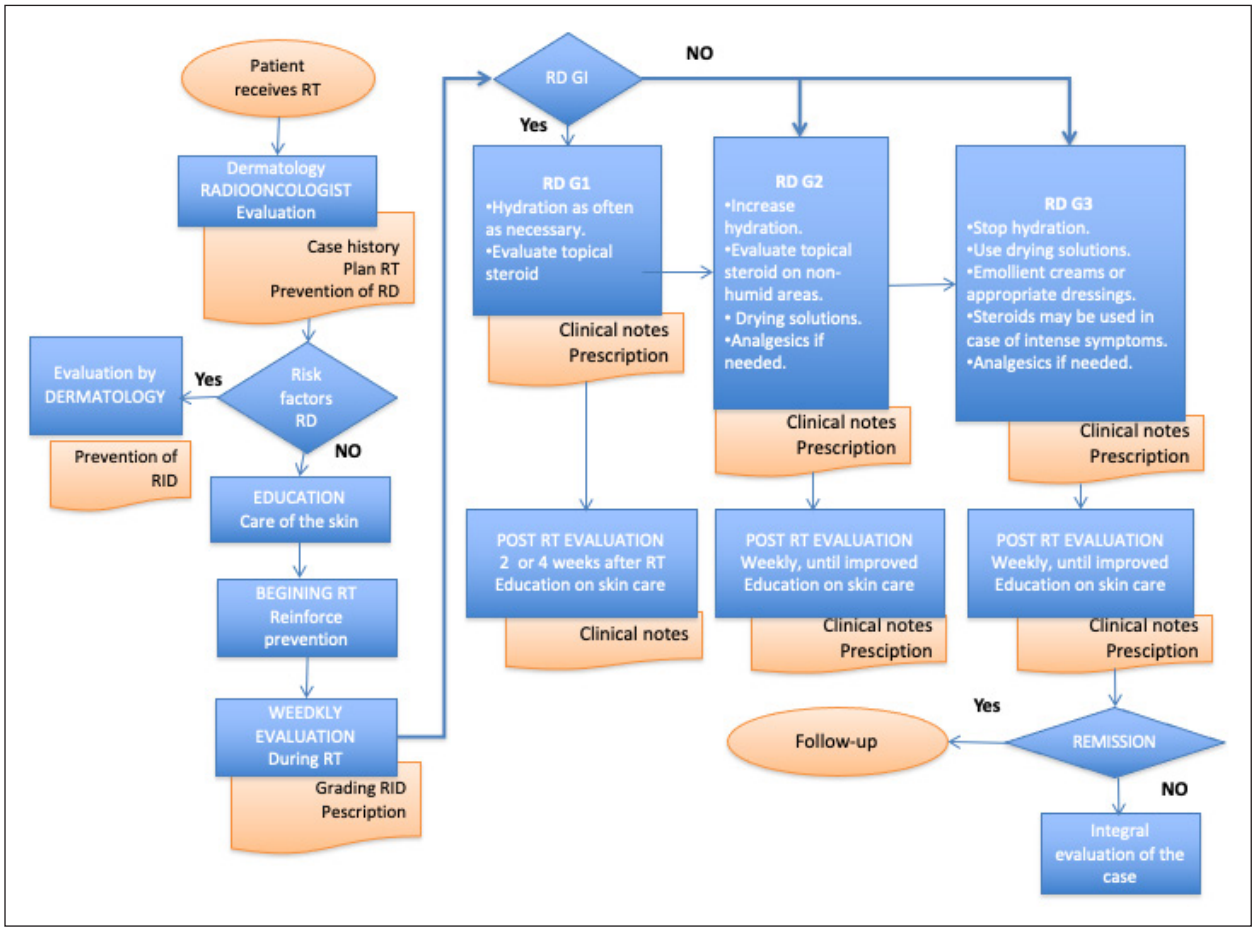


Figure 2. Process flow diagram for management of acute radiation dermatitis

radiation and in a randomized study, it reduced the incidence of RD grade 3 [5, 20];

- urea 3%: results of use of this compound have proven compelling and it is recommended in preventing grades 2–3 of acute RD [7];
- calendula: have anti-inflammatory, antibacterial, antifungal, antioxidant and angiogenic properties. In a randomized study, calendula significantly reduced the frequency of acute RD grade 2 when compared to trolamine. Additionally, patients required fewer interruptions of RT and reported less stinging, burning, pain [5];
- aloe vera: recommended to relieve erythema but there is no consensus regarding its application. However, when cumulative doses of RT are higher than 27 Gy, the application of aloe vera gel has provided protective effects from unwanted reactions due to its anti-inflammatory and antibacterial effects [21].

A multinational study [22] was carried out on women who began RT for breast cancer to evaluate the combination of hygiene products. The goal was to demonstrate the tolerance of a dermocosmetics regimen specifically on the radiated area and its efficacy for reducing or retarding the intensity of acute RD. The results were measured for erythema, edema, dryness of skin, desquamation, and evaluation of the physical condition of the patient using an "index of benefit" to the patient, carried out at the beginning and at the end of treatment (± 2 weeks). In the study group, 36% of patients were non-habitual users of dermocosmetics while 57% were habitual users. Dermocosmetic care regimes were well tolerated on radiated skin and this group presented less severe RD than those patients who did not.

Medical device with hyaluronic acid for the management of radiation dermatitis

The medical device used in RD is a topical gel composed of the following [23]: hyaluronic acid, gluconolactone, poliacrilamide and xanthan gum

(Annex 4). It is indicated in the treatments of symptoms of the skin such as: erythema, burning sensation, stinging and pruritus caused by RT or other causes. It acts by forming a protective barrier shield that reduces transepidermic water loss, increases hydration and promotes the healing process of the skin, including folds and wrinkles, with or without minor abrasions.

There are two studies supporting the action of the medical device with hyaluronic acid [23, 24]. Iacovelli et al. 2017 [23], a pilot study at the Referral Center for the Treatment and Management of Cancer, Milan, Italy, evaluated patients over the age of 18 with head and neck tumors with neck nodes inclusion who received > 50 Gy RT treatment. The patients were evaluated for cutaneous toxicity during treatment and up to 2 weeks after the treatment. All radiated subjects were instructed on the application of a layer of the medical device, twice daily on the radiated area, avoiding application 1 to 4 hours before the RT session, from the first day of treatment until 2 weeks after the treatment was completed. The treatment with the medical device reduced the rate of cutaneous toxicity up to 20% in RT treated patients. 2) Ingargiola et al. 2020 [24], in a unicenter-2 branch clinical setting, open labeling, randomized study, compared the medical device associated to a previous standard of care study *vs* a standard care only study, to prevent and treat acute RD in cancer of the head and neck, and breast cancer patients, undergoing RT. Patients were told to apply the medical device in the radiated area 3 times a day, beginning with the first day of RT and up to 2 weeks after completing the treatment or until grade 3 RD developed. On week 5, the percentage of breast cancer patients that had received the medical device that did not present with G2 RD was greater than the control group. Quality of life index measured with Skindex-16 was always greater in the patients using the medical device which delayed the time for developing RD.

Topical corticosteroids in RD

Topical corticosteroid [25] have been used for a long time in the prevention and treatment of RD due to their underlying anti-inflammatory physiopathology [18] immunosuppressive, antiproliferative and vasoconstrictive properties. Various cytokines and proteins are the target of this pharmacological group, with reduction of the production of IL-1, IL-2, IFN-TNF and inductive lipocortins that inhibit the release of phospholipase A2. The suppression of queratinocyte mitosis and the inhibition of the migration and proliferation of fibroblasts explain the antiproliferative effects. The application of steroids of low to medium potency in the field of treatment 1 or 2 times a day after each RT session was used to reduce the severity of acute RD and decrease symptoms, such as pruritus, irritation, burning and discomfort. Topical steroids used in RD [25]: hydrocortisone, ,ometasone, betamethasone, beclomethasone, methylprednisolone (Annex 7, 10).

Appropriate dressings/bandages for RD

For RD grades 2 and 3, treatment should be directed toward prevention of secondary infections and to cover these areas. The bandages are used to maintain a moist environment on de-epithelialized skin, allowing greater healing of the wounds [18]. Characteristics of the bandages [4, 27]:

- non traumatic: they do not adhere to the damaged skin in order to decrease pain upon changing of the bandages;
- non-adhesive base or only with silicone: to avoid damaging delicate or damaged skin;
- absorbent: capable of containing the exudate;
- adaptable: for areas with limitations in their application, such as the neck or the pelvic area;
- comfortable: to improve tolerance on the part of the patient and to reduce pain while the bandage is on the skin;
- ease in applying and removing: so that patients can do this themselves at home.

Examples of bandages used in RD treatment:

- hydrogel bandages: do not adhere to the wounds and allow for easy cleansing and application [18];
- hydrocoloid bandages: absorbent, self-adhering, can be left in place for several days to simplify the care [18];
- silver bandages: antibacterial properties, prevent progression of the lesions [21, 26].

Kedge [27] in a systematic review, included an analysis of 10 studies, analyzed the effectiveness and acceptability of the interventions on moist desquamation on patients treated with RT. The use of hydrogel and hydrocolloid bandages is well established for the healing of moist wounds, and it alleviates patients' symptoms. However, there is mixed evidence on their effectiveness and more research is needed to issue more accurate recommendations.

Analgesics

If RD is causing pain or discomfort, the use of the pain scale of the World Health Organization (WHO) is to be used as the reference for adequate pain management [4, 27].

Antibiotics

If the affected skin becomes infected, it should be treated with topical or systemic antibiotics, according to the severity of the infection [26, 28]. Topical antibiotics should be avoided unless a swab of the wound has been made and the bacterial infection is confirmed [15, 21].

Nutritional supplements and vitamins

Zinc supplements used in conjunction with RT can postpone the development of mucositis and severe dermatitis in patients with cancer of the head and neck. There is evidence that suggests the use of zinc is useful in prevention of acute RD, but more information is required to support this recommendation [7]. Ascorbic acid (vitamin C) has a powerful antioxidant and free radical elimination properties but, in studies, no benefit has been able to be demonstrated. Pantothenic acid (vitamin B_5) has a central role in metabolism and is essential for the integrity of normal skin. However, when compared to placebo, it didn't demonstrate a protective effect against RD [5].

Surgical intervention

Advanced lesions (RTOG 4) should be managed as conservatively as possible before surgical debridement and reconstruction with skin grafts and myocutaneous flaps is considered [26].

Other therapeutic interventions

Beta-sitosterol, an herb-based formula with antibacterial, analgesic, and anti-inflammatory effects, in a clinical trial *vs* trolamine were not associated with relevant improvement of RD, although the incidence of severe pruritus and local pain was significantly reduced [5]. Oils: In a clinical trial of 94 patients with head and neck cancer that presented acute RD, the intensity of the symptoms was reduced with the application of olive oil. In a trial of 50 patients, a cream containing curcuma (turmeric) and sandalwood oil was able to prevent the appearance of cutaneous lesions [5]. Superoxide dismutase (SOD): the topical use of SOD once a day showed promising results but greater research to support the recommendation is required [7]. Silver sulfadiazine: in a randomized controlled study, cream at 1%, 3 times/day, 3 days a week was shown, for 5 weeks during RT and one week after, to reduce the severity of RD compared to general care of the skin only. But due to potential secondary effects, it is reserved optionally for patients with high risk of acute RD [26].

Referral and counter referral

Any patient that presents with high risk for developing RD should be referred to the dermatologist. Patients with RD grade 2 or greater should also be referred [7].

Nevertheless, due to the lack of dermatologists in the institutions where patients receive RT, it is necessary for the radiation oncologist to be qualified to prevent and treat the toxicity caused by radiation to the skin.

Materials and methods

A search of national and international evidence was carried out regarding the management and guidelines of RD and a synthesis was made. A consensus of 25 radiation oncology and dermatology management experts was gathered.

A questionnaire of twenty questions with two types of answers was constructed:

1. Open, in relation to the degree of acceptance of the proposed alternative therapy. The choices were: completely agree, partially agree, disagree, no opinion.
2. Structured, based on the frequency of the use of the alternative therapy. The choices were: always (100%), very frequently (80% or more of the patients), frequently (between 50–80% of the patients), sometimes (20–50% of the patients), less frequently (less than 20% of the patients), and never (Annex 5).

A threshold of 80% or higher was used to define consensus. If at any time in the survey a management strategy was selected by fewer than 10% of panelists, it was not included as an option.

An iterative process was structured at the beginning using the Delphi method for answering questions in several rounds by experts, so that answers become more specific. This did not continue because the opinion of the experts converged by

70% or more, in 11 of the 20 questions. In the questions relating to the change from dermocosmetics to medical device (6 questions), convergence did not reach 70% because not all participants had access to the medical devices in their institutions and due to the lack of published evidence. In the remaining three questions, two of them did not reach the stipulated convergence because there was no dermatology department in their institutions to refer the patients to. The last question, regarding RD grade 4, was divided between very infrequent (55%) and never (45%).

Results

The results of the questions are summarized in Table 5. More than 80% of the panel agreed with the statement that the use of dermocosmet-

Table 5. Questions and physician consensus

Questions	Physician consensus	Answer panel
1. How much do you agree with the following sentence: In RT treatment, education and recommendations regarding the care of the skin should be made from the beginning.	All of the members agree that the care of the skin should be included in the education of the RT patient and as preventive recommendations to reduce the severity of RD	100% always
2. Given the diversity in phenotypes and comorbidities of our patients, how frequently should they be sent to dermatology for consultation before the beginning of RT?	Referral of patients to the dermatology department for evaluation before RT is indicated when there are logistical conditions for this and always when the patient presents risk factors for developing serious lesions	85% sometimes, + a little
3. How much do you agree with the following sentence: In the management of RT, should the use of topical non-pharmacologic agents (dermocosmetics) be recommended from the very first session?	The topical use of moisturizing and hydrating creams and other products, such as the medical device with hyaluronic acid, should be recommended from the beginning of RT	90% always
4. How much do you agree with the following sentence: Given the high incidence of the appearance of RD (> 80%), the use of topical pharmacologic treatments should be recommended as preventive (medical device) from the first session.	Based on the clinical experience and the available current evidence, the authors recommend the use of hydrating and moisturizing creams as a preventive measure to reduce the intensity of RD	80% always
5. How much do you agree with the following sentence: In RT, education and recommendations should be carried out (or continued) regarding skin care once RT has begun, although no RD has appeared.	All of the members agree that this care should be kept up even if no lesions appear during the course of RT	100% always
6. Once RD grade 1 appears, aside from the recommendations given at the beginning of RT, how frequently should there be a change from dermocosmetics to the medical device?	In RD grade 1, application of the indicated hydrating product with greater frequency is recommended from the beginning of RT, but not the use of topical steroids. There was no consensus on the need to change the moisturing or hydrating cream for the medical device with hyaluronic acid	55% sometimes, a little
7. Once RD grade 1 appears, aside from the recommendations given at the beginning of RT, how frequently should topical steroids be used to lessen symptoms?		90% never
8. In the treatment of RD grade 1, along with the measures recommended at the beginning of RT, how frequently do you recommend changing from dermocosmetics to the medical device?		85% sometimes, a little
9. When RD grade 2 appears, how frequently should patients be sent for consultation with the dermatology department?	The panelists do not consider the referral, with evaluation and management, to the dermatology department in cases of RD grade 2. Additionally, they postulate that the radio-oncologist should be prepared to treat all toxicities related to the use of RT	85% sometimes, a little
10. Once RD grade 2 appears, along with the measures recommended at the beginning of RT, how frequently do you change from dermocosmetics to the medical device?	In RD grade 2, the changing of the hydrating or moisturizing cream in favor of the medical device with hyaluronic acid might be considered	55% frequently-sometimes)
11. In the treatment of patients with RD grade 2, along with the measures recommended at the beginning of RT, how frequently do you prescribe topical steroids to lessen symptoms?	The use of topical steroids to lessen symptoms such as pruritus or pain is recommended	71% frequently

Table 5. Questions and physician consensus

Questions	Physician consensus	Answer panel
12. In the treatment of patients with RD grade 2, along with the measures recommended at the beginning of RT, how frequently do you change from dermocosmetics to the medical device?	More less 50% of the panelists change the dermocosmetics to the medical device	55% frequently
13. When RD grade 3 appears, how frequently do you send your patients for consultation to the dermatology department?	In case of RD 3, the doctors considered recommending evaluation by the dermatology department	85% frequently
14. When RD grade 3 appears, along with the measures recommended at the beginning of RT, how frequently do you change from dermocosmetics to the medical device?	The 55% of the panelists do not changed to medical device	55% never
15. When RD grade 3-4 appears, in addition to the recommendations at the beginning of RT, how frequently do you add an inert paste or other measure to reduce the moisture of the lesion?	For the management of RD grade 3, the recommendation is the use of pharmacological products with drying effects. Topical steroids should be applied only on dry areas.	70% always
16. In the treatment of patients with RD grade 3, along with the measures recommended at the beginning of RT, how frequently do you prescribe topical steroids to lessen the symptoms?		85% always, very frequently, frequently
17.In the treatment of patients with RD grade 3, along with the measures recommended at the beginning of RT, how frequently do you recommend changing to the medical device?	The panelists don't consensus to recommend changing to medical device	50% always–frequently
18. How frequently does grade 4 RD present in your patients.	RD grade 4 is not frequent and is unlikely	95% a little, never
19. How much do you agree with the following sentence: After RT, education and recommendations on the care of the skin should be continued, to avoid or reduce the severity of late lesion (chronic RD) of the skin due to RT	Just all of the members agree that the care of the skin should be continued to avoid or reduce the severity of late skin lesions	95% always
20. When chronic RD grade 3-4 appears, how frequently should patients be sent for consultation to the dermatology department?	In case it presents, the cause should be investigated and treated with multidisciplinary management as conservatively as possible, leaving surgery as a last resort	90% agree

RD — radiationdermatitis; RT — radiation therapy

ics or the medical device can be recommended in the prevention of RD and in the treatment of RD grades 1 and 2. As for grade 3, they recommend individualizing each case and reaching an agreement with a dermatologist. Steroids should be used when there is burning or pain of the skin, a topical steroid should be applied. Given the availability and cost of the bandages in our country (Mexico), they consider the use of soaking elements (cold chamomile or oatmeal powder) to be a possible alternative. Care of the skin must be continued to avoid or reduce the severity of late skin lesions. Management algorithm was proposed (Fig. 2).

Discussion

Faced with the inability to avoid RD, all the members agree that care of the skin should be included in the education of the RT patient and as a preventive recommendation to reduce the severity of RD. This strategy is also recommended by the Society and College of Radiographers (SCoR) [4, 14. 15].

In the SCoR, emphasis is placed on standardized dermatologic evaluation [14] before and during RT, for identifying risk factors for developing more severe RD. The panel did not reach a consensus because most of the institutions did not have a dermatology department where they could seek support. Additionally, the panelists postulate that the radiation oncologist should be prepared to treat all toxicities related to the use of RT and, in the case of RD grade 3, the panelists considered recommending evaluation by the dermatologist. Also, unfortunately in Mexico we need to empower nurses to be part of RD treatment.

Almost all the participants in the panel agreed on the topical use of moisturizing and hydrating creams and other products from the start of RT, as is mentioned in the SCoR guide[14]. Care should be maintained for life due to the risk of developing

chronic RD, especially in patients that received systemic treatment along with RT.

In RD grade 1 and 2, the application of the indicated hydrating product with greater frequency is recommended, but not the systematic use of topical steroids, only to lessen symptoms such as itching or pain. This is in accordance with the SCoR guide, and they should not be applied on areas of moist desquamation [14].

In agreement with SCoR [14], for the management of RD grade 3, the panel recommendation is the use of pharmacological products with drying effects. The panelists did not reach consensus for recommending a change to the medical device due to the scarcity of published evidence [23, 24] on its efficacy and on its availability.

Based on the above, we consider that a single round of questions was sufficient to establish a consensus of experts for the management of RD in our country. However, we are conscious of the lack of procedural manuals and registry of the frequency, severity, and management of this adverse event in our institutions, so we propose a flow chart (Fig. 2) to standardize attention of RD on a national level.

It is needed to consider new approaches in RD treatment. The use of Photobiomodulation therapy (PBMT) is an emerging intervention to reduce RD, although further research is needed on long-term effects of the use of PBMT as a prophylactic intervention before it could be recommended [29, 30]. Different barrier films/dressings such as Mepitel film, StrataXRT, Cavilon No Sting Barrier Film [31–34] should be considered in the future, when they have approval in our country.

Also, we need to consider continuous evolution in RD management based on different radiation techniques (IMRT, APBI) and different schedules (hypofractionation or extreme hypofractionation) in breast cancer, for example, with no difference in RD incidence [35–39].

Conclusions

This consensus was developed as a supportive educational tool that can be adapted to individual clinical needs and institutional context. We hope that it will be useful for professionals involved in RT treatment of patients.

The consensus of the specialists is that dermocosmetics or the medical device can be recommended in the prevention of RD and in the treatment of RD grades 1 and 2. As for grade 3, they recommend individualizing each case and designing each treatment together with a dermatologist.

The steroids should be used taking the symptoms of the patients into account. When there is itching or pain of the skin, a topical steroid should be applied.

Given the availability and cost of bandages in our country (Mexico), the panel considers a possible alternative of using soaking elements (cold chamomile or oatmeal powder).

Care of the skin must be continued to avoid or reduce the severity of late skin lesions.

Acknowledgements

This study was presented as an poster on ASTRO 2021 SOMERA, Galapharma.

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