Chapter 2
Localized Scleroderma

Carolyn A. Bangert, Andrew Kim, and Heidi Jacobe

Abstract Morphea (localized scleroderma) is an autoimmune disease characterized by sclerosis of the skin and, in some cases, subcutaneous tissue. It occurs in children and adults. It is distinct from systemic sclerosis, but may nevertheless be associated with significant functional and cosmetic impairment. Morphea has several distinct subtypes, including circumscribed, linear, and generalized, all of which can occur in superficial and deep forms. The linear subtype is more common in children, and the circumscribed is more common in adults. Evaluation is aimed at confirming the diagnosis and clinical subtype, assessing the stage of activity, and determining the potential for/or the presence of morbidity. Therapy includes topical, phototherapy, or systemic treatments and is aimed at halting progression, preventing morbidity, and speeding remission.

Keywords Morphea • Localized scleroderma • Linear scleroderma • Hemifacial atrophy • Parry–Romberg syndrome

Introduction

Morphea (localized scleroderma) is an autoimmune disease of the skin characterized by sclerosis of the dermis, subcutaneous fat, and in some cases, fascia and deeper tissues. Although commonly confused with systemic sclerosis (SSc, scleroderma) due to identical histologic features, it is distinct from SSc in the absence of acrosclerosis, SSc antibodies, and different end-organ involvement. Morphea has

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been associated with permanent functional and cosmetic impairment, particularly in its deeper and linear and generalized forms.

Morphea affects both children and adults, with the linear subtype predominating in children, and the generalized and circumscribed predominating in adults. The pathogenesis is poorly understood, with most studies extrapolating causality from SSc. The upregulation of vascular adhesion molecules (ICAM-1 and VCAM-1) and vascular damage triggers a Th2 response that results in the upregulation of TGF-β, which induces the overproduction of collagen and other extracellular matrix components leading to the clinical and histologic changes of sclerosis.

Morphea has several subtypes, each with a distinct distribution and depth of involvement. Although classification schemes vary, it is generally subdivided into circumscribed (plaque), linear (including morphea en coup de sabre and hemifacial atrophy, or Parry–Romberg syndrome), and generalized (including pansclerotic), and mixed (Table 2.1). Each subtype may be superficial or deep. Morphea characteristically occurs in three stages: inflammatory, sclerotic, and atrophic. The inflammatory, or active, phase is characterized by progression of lesions in size, depth, and number and is usually associated with clinical evidence of inflammation in the skin lesions (Figs. 2.1, 2.2, and 2.3). The sclerotic phase is characterized by stable sclerosis with varied amounts of pigmentary alteration. Of note, lesions at this point do not enlarge (Figs. 2.4 and 2.5). The atrophic phase is characterized by permanent changes that are variable in severity depending on the extent and subtype of disease (Figs. 2.6, 2.7, 2.8, and 2.9). Patients may have a more limited course or a chronic course, with several episodes of relapses and remissions occurring over many years [1]. In some cases, previously inactive morphea may reactivate many years after initial presentation. In some cases morphea may be associated with systemic findings of arthritis, ocular changes, and neurologic manifestations, but lacks the systemic involvement seen in SSc [2].

Evaluation and therapy of morphea is first aimed at confirming the diagnosis (Table 2.1). Diagnosis is made based on clinical findings and corroborating evidence of inflammation [3], sclerosis on histology, and imaging if clinically indicated [4, 5]. Antinuclear and other antibodies may be present but are not generally helpful in confirming the diagnosis. Once the diagnosis is confirmed, appropriate evaluation includes ascertainment of subtype (Table 2.2, Figs. 2.10, 2.11, 2.12, 2.13, 2.14, 2.15, 2.16, 2.17, 2.18, and 2.19), activity of lesions, extent of involvement, associated findings, and presence or potential for cosmetic or functional disfigurement (Fig. 2.16).

Treatment varies depending on the extent and depth of disease, disease activity, and potential for morbidity (Fig. 2.20). Although randomized controlled trials are few, topical therapy is generally used for more limited superficial disease, phototherapy for more extensive superficial disease (Fig. 2.21), and systemic immunosuppressive therapy for deeper or more extensive disease and disease with a greater potential for morbidity. Therapy is most effective in the inflammatory phase and has no role in improving the atrophic phase. Therapeutic goals include arresting activity and halting progression, speeding remission, and preventing long-term morbidity. The optimal duration of therapy is unknown. For systemic therapy,
Table 2.1  Differential diagnosis of morphea

Most likely
1. Scleroderma (systemic sclerosis)
2. Lipodermatosclerosis
3. Eosinophilic fasciitis
4. Trauma-induced fat necrosis (intramuscular injections)
5. Nephrogenic systemic fibrosis
6. Chronic graft-versus-host disease

Consider
1. Lichen sclerosus
2. Pretibial myxedema
3. Connective tissue nevi
4. Morpheaform basal cell carcinoma
5. Chemical-mediated sclerosing skin conditions (chemotherapy with bleomycin or toxanes, toxic oil syndrome, rapeseed oil, etc.)
6. Lyme disease (acrodermatitis atrophicans)
7. Phenylketonuria
8. Scleromyxedema, scleroderma chronica, pretibial myxedema
9. POEMS syndrome

Always rule out
1. Carcinoma of the breast metastatic to skin (carcinoma en cuirase)
2. Porphyria cutanea tarda

POEMS polyneuropathy, organomegaly, endocrinopathy, M protein, and skin changes

Fig. 2.1  This patient has plaques with central sclerosis (central brown yellow areas) surrounded by peripheral erythema on the abdomen and inframammary folds. This is characteristic of active lesions. With successful treatment, erythema quickly resolves and is replaced by post-inflammatory hyperpigmentation. Central sclerosis is more persistent, gradually softening over several months.

limited data consisting of expert consensus and one observational study indicates longer duration of methotrexate (MTX) at about 2 years or so seems to decrease risk of reactivation in short-term [6, 7]. In the author’s experience, once disease activity
has been halted for 6 months and improvement in sclerosis has halted, MTX may be slowly tapered by 2.5 mg every 1–2 months. The prognosis is variable and depends on disease subtype, extent of disease, and interindividual variability.

**Fig. 2.2** Inflammatory linear morphea with involvement of the subcutaneous tissue evidenced by loss of the normal contour of the hip (*black arrow*). This is an indication for systemic treatment as treatments directed from the outside would not penetrate into the area of pathology (oral methotrexate and prednisone were prescribed). Although treatment halted progression and produced skin softening, loss of subcutaneous tissue persists.

**Fig. 2.3** Early inflammatory morphea is characterized by minimal induration and poorly circumscribed, reticulated erythematous plaques. Aggressive treatment at this stage produces near complete resolution of the lesions, especially phototherapy such as UVA1.
**Fig. 2.4** Hyper- and hypopigmentation on the abdomen in a patient with circumscribed morphea. If there is a sclerotic component, the patient may respond modestly to topical or intralesional therapy, but this form of morphea is largely unaltered by therapeutic intervention.

**Fig. 2.5** Child with multiple linear lesions of the trunk. These lesions are transitioning from the active to sclerotic phase with central sclerosis and a mixture of peripheral hyperpigmentation and erythema. This lesion is amenable to treatment with either phototherapy or methotrexate. In the experience of the authors, systemic glucocorticoids may be unnecessary in these lesions if they are slowly progressive.
Fig. 2.6  Atrophic phase linear morphea of the abdomen with hyperpigmentation and dermal atrophy with associated cliff drop. This is in contrast to subcutaneous atrophy in which the normal body contour is altered. The sclerosis and hyperpigmentation may improve with time, but therapy medical is not indicated.

Fig. 2.7  Hyperpigmentation in a patient with atrophic (dermal atrophy) stage morphea. The lesions are soft to palpation. This phase of morphea does not respond to medical treatment, although the dyspigmentation may gradually improve with time.
**Fig. 2.8** Atrophic phase-deep linear morphea on the leg of a child with appreciable limb length and limb girth discrepancy. There is atrophy of the subcutaneous tissue with loss of the patellar fat pad, but sclerosis has resolved. Unfortunately, these lesions are inactive and are not expected to improve with immunosuppressives. When the disease of this type is active, aggressive therapy with a 3-month course of pulsed or oral steroids and maintenance with methotrexate is indicated to prevent morbidity. Physical therapy is also recommended to maintain the range of motion in joints.
Fig. 2.9  Linear morphea of the upper back and shoulder in an adult patient with dyspigmentation, hair loss, and dermal atrophy with increased vascular prominence of the posterior shoulder consistent with damage but no evidence of disease activity. Linear morphea most frequently involves the extremities and head. Involvement of the trunk and one or both limbs on the ipsilateral side is not uncommon, but concomitant head involvement is rare. Linear lesions on the trunk may be confused with circumscribed morphea, but the abrupt discontinuation of the lesion at the midline is a diagnostic clue. Treatment of active linear morphea depends on the depth of disease, but generally involves systemic immunosuppressive therapy.
### Table 2.2 Proposed classification of morphea subtypes

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<tr>
<th>Morphea subtype</th>
<th>Modifiers</th>
<th>Clinical</th>
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<tr>
<td>Circumscribed</td>
<td>Superficial (Fig. 2.10a)</td>
<td>Single or multiple oval/round lesions limited to epidermis and dermis</td>
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<td></td>
<td>Deep (Fig. 2.10b)</td>
<td>Single or multiple oval/round lesions involving subcutaneous tissue, fascia, or muscle</td>
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<td>Linear (Figs. 2.14, 2.15, and 2.16)</td>
<td>Trunk/lungs</td>
<td>Linear lesions involving possible primary site of involvement in subcutaneous tissue with or without involvement of epidermis, dermis, muscle, or bone</td>
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<td>Figures 2.11, 2.12, and 2.13</td>
<td>Head</td>
<td>En coup de sabre, progressive facial hemiatrophy, linear lesions of the face (may involve underlying bone)</td>
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<td>Generalized</td>
<td>1. Coalescent plaque Figure 2.17</td>
<td>≥4 plaques in at least 2 of 7 anatomic sites (head–neck, right/left upper extremity, right/left lower extremity, anterior/posterior trunk); Isomorphic pattern: coalescent plaques inframammary fold, waistline, lower abdomen, proximal thighs; Symmetric pattern: symmetric plaques circumferential around breasts, umbilicus, arms, and legs</td>
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<td>2. Pansclerotic Figure 2.19</td>
<td>Circumferential involvement of majority of body surface area (sparring fingertips and toes), affecting skin, subcutaneous tissue, muscle, or bone; no internal organ involvement</td>
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<tr>
<td>Mixed</td>
<td>Combination of any above subtype: ex: linear-circumscribed</td>
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**Fig. 2.10** (a) Circumscribed morphea with oval plaques bilateral thighs. Lesions are in varied stages of evolution including hyperpigmented inactive plaques (L thigh) and active erythematous plaques (R thigh). Presence of active and inactive lesions is relatively common. In this case the active lesions may be treated with a topical preparation such as fluocinonide 0.05 % ointment or calcipotriene ointment. If the lesions continue to multiply, therapy aimed at suppressing progression such as phototherapy is indicated. (b) Circumscribed morphea with subcutaneous involvement indicated by abnormal contour of bilateral lower extremities (black arrows). These lesions display both activity (red arrow) manifested by peripheral erythema and induration and pigmenitary alteration and atrophy (dermal and subcutaneous). This patient responded well to oral methotrexate.
Fig. 2.11  Linear morphea of the head and neck in a child with hemifacial atrophy involving the right chin and cheek (a, c) and en coup de sabre of the right lateral forehead (b). En coup de sabre and hemifacial atrophy are variants of linear morphea of the head and neck that may occur separately but frequently coexist. Complications include ocular and neurologic changes. A history of headaches, seizures, or eye changes should be solicited and evaluation by ophthalmology and neurology initiated if present. En coup de sabre generally involves the paramedian or lateral forehead, scalp, and other regions of the upper face, while hemifacial atrophy most commonly involves skin and deeper tissues (including muscle and bone) of the lower face. A clinically apparent inflammatory phase is rare, making assessment of disease activity challenging. Systemic therapy is usually employed for treatment of active disease
Fig. 2.12 Linear morphea of the forehead, nose, and chin (en coup de sabre) in a child. Ascertaining clinical activity is difficult, and is primarily done by history and serial photography. Systemic immunosuppressive therapy is used to arrest disease progression, but significant improvement in the sclerosis and atrophy is unlikely.
Fig. 2.13  Child with linear morphea (en coup de sabre) involving the left forehead, upper lip, chin, and neck. Lesions are inactive.

Fig. 2.14  Linear morphea of the upper back and shoulder in an adult patient with dyspigmentation, hair loss, and dermal atrophy with increased vascular prominence of the posterior shoulder consistent with damage but no evidence of disease activity. Linear morphea most frequently involves the extremities and head. Involvement of the trunk and one or both limbs on the ipsilateral side is not uncommon, but concomitant head involvement is rare. Linear lesions on the trunk may be confused with circumscribed morphea, but the abrupt discontinuation of the lesion at the midline is a diagnostic clue. Treatment of active linear morphea depends on the depth of disease, but generally involves systemic immunosuppressive therapy.
Fig. 2.15 Hyperpigmentation in linear morphea of the abdomen and thigh. Her disease is inactive and requires only clinical monitoring
Fig. 2.16  Child with linear morphea of the left lower extremity. In this case, there is severe damage with limb length discrepancy and subcutaneous and muscular atrophy. The skin has softened. This lesion will not improve with immunosuppressives. Rather, treatment is aimed at minimizing damage via physical therapy.
Fig. 2.17 Generalized morphea with typical coalescent plaques distributed over trunk and extremities. This patient’s lesions are inactive due to aggressive treatment with prednisone tapered over 4 months and methotrexate weekly for 2 years which produced remission and lesion softening. Note that residual hyperpigmentation remains.

Fig. 2.18 Patient with active pansclerotic morphea (note erythema indicated by arrows) (a). This patient was treated with oral prednisone and methotrexate with resolution of activity and eventual softening and hyperpigmentation (b).
Fig. 2.19  Pansclerotic morphea with characteristic contiguous sheets of sclerosis beginning on trunk spreading to total body involvement sparing the face, areolae, fingers, and toes. This underscores the difference between pansclerotic morphea and systemic sclerosis, which begins with acrosclerosis. This patient developed a restrictive pulmonary defect due to circumferential sclerosis of the chest, skin ulcerations, and contractures. Despite treatment with prednisone, methotrexate, UVA1 phototherapy, antithymocyte globulin, cyclosporin, and mycophenolate mofetil, she succumbed due to complications of her morphea. Pansclerotic morphea warrants early aggressive treatment with immunosuppressives due to its poor prognosis.

Fig. 2.20  Therapeutic algorithm for morphea based on existing evidence [Adapted from Jacobe H, Saxton-Daniels S: Morphea. Chapter 64. In: Fitzpatrick’s Dermatology in General Medicine, 8e. Edited by Goldsmith, et al. New York: McGraw-Hill; 2012:692-701. With permission from McGraw-Hill Global Education Holdings, LLC]
References

A Visual Guide to Scleroderma and Approach to Treatment
MAYES, M. (Ed.)
2014, XII, 114 p. 129 illus., 115 illus. in color., Hardcover
ISBN: 978-1-4939-0979-7