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REVIEW ARTICLE

Current Management of Pediatric Vitiligo

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Abstract Vitiligo is a common inflammatory disorder with worldwide prevalence of 0.4–2 % of the population, with half of cases beginning in childhood. The management of childhood vitiligo should be tailored to avoid negative effects on the overall growth and psychological development of the patient. Therapy of vitiligo in childhood is chosen based on the location of the lesions, lesion age, and extent of lesions in the context of the child's age and the developmental status of the child. There are four age categories in childhood vitiligo: [1] infantile and toddler (rare) (ages 0–3 years), [2] ages 4–8 years, [3] ages 9–12 years, and [4] 13+ years of age, based on developmental stage, psychological maturation, and ability to comply or participate in therapy. These categories are also differentiated psychologically by susceptibility to bullying, self-image development, and personal concern with lesion appearance, which increases with time. Intervention is advisable in cases with facial and leg involvement due to prominence of lesions and cosmetic defect. Medical interventions are largely the usage of topical therapies including corticosteroids and calcineurin inhibitors, some vitamin therapy (oral and topical vitamin D), and judicious introduction of phototherapy sources based on age and severity. Screening and appropriate subspecialist referral for co-morbidities (e.g., thyroid disease, celiac disease, psychological distress, and vitamin D deficiency) may enhance overall health. Cosmesis and camouflage are generally safe in childhood and have been noted to improve overall quality of life in this grouping. Genetic transmission of vitiligo is minimal at 5–6 % in first-degree relatives. This article reviews the therapeutics of pediatric vitiligo from the perspective of developmental stages and response to therapy.

Key Points

Pediatric vitiligo is an autoimmune disorder in which loss of pigmentation is noted and which causes significant cosmetic and psychological co-morbidities.

One third of pediatric vitiligo cases are segmental in nature.

Usage of topical calcineurin inhibitors for the head and neck, topical corticosteroids for the body, and narrowband ultraviolet B light therapy for widespread disease are the first-line approaches to vitiligo therapy.

1 Introduction

1.1 Epidemiology

The prevalence of vitiligo is 0.4–2 % worldwide [1], with half of cases of vitiligo beginning in childhood [2]; thus, the clinician must be aware of a variety of issues that exist in the care of pediatric vitiligo patients. Vitiligo in children

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has been linked to atopy, halo nevi and a family history of autoimmunity, while post-pubertal onset has been linked to thyroid disease and greater acrofacial disease [3]. Other issues include the safety and efficacy of therapeutic options available for young patients. Some therapies have intrinsic limitations in their administration for children. For example, phototherapy has frequent office visits which may interfere with school and activities, potentially poor insurance coverage, and may be limited by a child's inability to hold still or be confined to small spaces. The specific psychosocial issues affecting children and adolescents with vitiligo, ranging from early childhood bullying to adolescent difficulties with self-image, are an important class of comorbidities to address [4]. This article presents an overview of evidence-based pediatric vitiligo therapies and of the age-specific needs of the four identified subgroups: (1) infant/toddler (ages 0–3 years), (2) school-aged children (ages 4–8 years), (3) pre-teens (ages 9–12 years), and (4) adolescents (ages 13–17 years).

1.2 Literature Review

References for this review were taken from a PubMed literature search of articles using the search terms 'pediatric vitiligo' or 'childhood vitiligo', limited to English language literature, and focusing on literature since 2000. Due to the publication of guidelines and systematic reviews of therapeutics for vitiligo, a focus on therapeutics endorsed by prior systematic review was chosen. The reader is encouraged to review three types of papers that focus on these systematic reviews: the recommendations of the Vitiligo European Task Force [5], Cochrane Review [6], and national consensus statements on vitiligo therapeutics [7–9].

2 Overview of the Management of Pediatric Vitiligo

While vitiligo is often termed a 'cosmetic' defect, it is in fact a cutaneous and systemic inflammatory illness associated with autoimmunity, including thyroid disease [10–12] (Table 1). The disease usually produces a progressively worsening cosmetic disability over time. Psychological disability is more commonly present than not, and worsens with advancing age of the child (see below). Furthermore, one-third of pediatric cases are segmental, which requires rapid intervention either by cream and/or early institution of 308-nm laser to produce repigmentation prior to loss of the melanocyte reservoirs from the hairs at the site of disease.

Pediatric vitiligo is treated via a topical approach, alternating between assorted treatment regimens and interspersing ultraviolet light therapies for localized resistant cases and/or extensive disease [13] [14]. Pediatric patients with vitiligo have been addressed by the Vitiligo European Task Force both in the description of disease and therapeutic recommendation in a series of recent articles [5, 15], specifically recommending that the first choice of medication be topical calcineurin inhibitors for the face, including eyelids, and mometasone furoate 0.1 % for body lesions, highlighting that these therapies are deemed to have the best therapeutic and side effect profiles [5].

2.1 Laboratory Abnormalities and Screening

Thyroid abnormalities can be noted in 10.7–26 % of pediatric vitiligo patients and can be associated with long-standing illness and large body surface area [16–19]. Vitamin D deficiency has been noted in children with vitiligo over the age of 3 years and has been associated with comorbid autoimmunity [20]. In children with celiac disease, 2.1 % have vitiligo [21]. Baseline and on-going evaluations should be performed. Appropriate initial screening, including thyroid levels, complete blood count, chemistries, and vitamin D screen (25 OH and 1, 25 OH [2]), is recommended. Antinuclear antibody testing should be performed when photosensitivity is suspected or prior to phototherapy, and celiac screening where secondary autoimmunity is suspected. Screening can be conducted for vitamin B12 and folate deficiencies in macrocytic anemias and for vegetarian patients. A recent study has looked at the presence of thyroid antibodies including anti-thyroid peroxidases (anti-TPO) and anti-thyroglobulin (anti-TG) antibodies. The researchers identified the presence of these antibodies in vitiligo patients aged 11–20 years (especially females) as being associated with development of autoimmune thyroid disease (70 % at 3 months). Therefore,

Table 1 Health implications of vitiligo as an autoimmune disease

Nutritional implications of vitiligo (monitoring and supplementation of vitamins and minerals)
Safety and efficacy of medications (risk–benefit ratio; short- and long-term outcomes)
Safety and efficacy of UV-based therapy (risk–benefit ratio; short- and long-term outcomes)
Compliance with care (e.g., impedance of steroid phobia; non-compliance)
Access to care
Psychological support for children and parents
Long-term management

these antibodies can be included in a panel to identify children requiring closer monitoring of their thyroid status [22].

2.2 Referral and Coordination of Care

Generally, patients should be referred to endocrinology for identified thyroid, glucose metabolism, vitamin D deficiency or other suspected endocrinopathy (e.g., Cushinoid features, Addisonian pigmentation). Patients with abdominal cramping, diarrhea, or who have a positive celiac screen should be referred to gastroenterology. Patients with macrocytic anemias or reduced B complex can be referred for vitamin B12 and folate supplementation with hematology. Children under psychological distress or who wish to undergo depigmentation should be referred to a psychology or psychiatric professional for intervention.

2.3 Psychological Aspects of Vitiligo

In a survey of 350 children under the age of 18 years, vitiligo often negatively affected the Children's Dermatology Life Quality Index (CDLQI). In this survey, 45.6 and 50 % of children aged 0–6 (group 1 and the first half of group 2) and 7–14 (second half of group 2 and group 3) years, respectively, are unbothered by their lesions, but less than 4.1 % of teenagers can say the same, with self-consciousness peaking between 15 and 17 years of age (group 4). The most bothersome sites of vitiligo lesions are face and legs. Itching is noted in almost one-third of patients, and is associated with self-consciousness, difficult interpersonal relationships, bullying, and teasing [4]. Retrospective reporting of childhood trauma by young adults with vitiligo demonstrates 40 % of patients reported prior negative childhood psychological experiences including shame and negative self-image, especially associated with lesions of the face, extremities and genitalia. Many patients report difficulty obtaining therapy from physicians as well [23–25]. Psychosocial issues in childhood are the basis of a lifetime of psychological issues and, therefore, early institution of treatment and careful provision of guidance, medical care, and psychological support for children with vitiligo and their parents is needed [13, 26].

2.4 Genetic Counseling

Vitiligo is associated with increased risk of autoimmune diatheses including vitiligo in the same patient and relatives. The risk of developing vitiligo in a first-degree relative and twin are 6.1 and 23 %, respectively, and this should be shared with parents and patients so that they can understand the relative risk of the event [27].

3 The Therapeutic Paradigm

Therapy for vitiligo of childhood (Table 2) is all off-label, despite the plethora of therapeutic articles in recent years describing new and effective therapeutic regimens. Topical and oral corticosteroids, topical calcineurin inhibitors, topical vitamin D compounds, phototherapy, oral vitamin supplementation, 308-nm laser (Xe Cl), and surgery are all therapeutic options for treating vitiligo. Therapy has been recently reviewed by the Vitiligo European Task Force [5], which encourages first-line usage of calcineurin inhibitors on the head and neck and mid-potency corticosteroids on the body, which can initiate and promote repigmentation of lesions, with augmentation through treatment adjustments and the use of narrowband UVB (NB-UVB) phototherapy for extensive disease and 308-nm laser local therapy for segmental disease and/or resistant localized lesions. Lesion response take a minimum of 3 months trial. Therapy for children needs to be coordinated with their school schedules and this may play a role in treatment choice; therefore, parents and children need to be included in the treatment decision making [13, 14, 28]. Other concerns include screening for and therapy of autoimmunity/endocrine pathology (see Sect. 2.1), screening for psychological issues (more common with facial and extremity lesions) (see Sect. 2.3), and referral for care by other practitioners where needed. Despite the fact that potential side effects must be reviewed with parents, there have not been major side effects reported with topical therapy or 308-nm laser used in childhood. Long-term data on outcomes and sequelae is lacking. Data supporting cyclic therapeutics has not been published; however, some children do not respond to the initial therapy after an appropriate therapeutic challenge, therefore alternatives can be offered based on these options.

Therapy should also be determined based on the localization and type of vitiligo. For instance, segmental vitiligo of the face has excellent response to topical tacrolimus with or without NB-UVB [29, 30]; however, a recent study has shown that early excimer laser institution by 5 months of disease activity produces best results. Segmental disease is also not associated with systemic symptoms such as laboratory abnormalities, unless it is noted in the setting of systemic disease [17]. Very pale patients may use avoidance of tanning as a therapeutic/cosmetic plan.

3.1 Topical Corticosteroids

Topical corticosteroids (mid-potency to high-potency but not ultra-potent) are first-line therapy for childhood vitiligo of the body, barring intertriginous and genital sites. Children, in particular dark-skinned patients with lesions on the face, respond to topical corticosteroids better than older,

Table 2 Medications used for vitiligo with pregnancy category and age restrictions

Drug	FDA pregnancy class	Age restrictions (US FDA labeling)	Side effects	Labeled warnings	Author comments
Topical therapies					
Low-mid potency topical corticosteroids (class III–VII)	C	From birth and upwards (check FDA label for specific agents)	Striae, atrophy, telangiectasia, steroid acne, Cushing's syndrome, adrenal suppression		<4years of age: Class V–VI on face/ intertriginous areas Class IV–III on body 4 years or older: Class II first-line treatment on body
High potency to super potent topical corticosteroids (class I–II)	C	From ages 12 years and over	Striae, atrophy, telangiectasia, steroid acne, Cushing's syndrome, adrenal suppression; studies have shown association with fetal growth restriction		Judicious brief usage with avoidance of striae-prone sites
Tacrolimus 0.1 % ointment	C	Ages 16 years and over	Burning, itching, pain at application site	Black box—malignancy risk	First-line treatment for facial/ eyelid vitiligo ages 16 years+; can be used in limited quantity in difficult-to-treat lesions in younger children
Tacrolimus 0.03 % ointment	C	Not for use <2 years	Burning, itching, pain at application site	Black box—malignancy risk	First-line treatment for facial/ eyelid vitiligo ages 2–15 years
Pimecrolimus 1 % cream	C	Not for use <2 years	Burning, itching, pain at application site	Black box—malignancy risk	Alternative first-line treatment for facial/eyelid vitiligo in children
Calcipotriene (0.005 %)	C	Data in childhood limited	Burning, skin irritation, hypercalcemia		Addition to topical corticosteroids can enhance response
Tacalcitol cream (4 μg/g)	C	Data in childhood limited	Burning, skin irritation, hypercalcemia		
Fixed dosage combination of betamethasone (0.064 %) and calcipotriene (0.005 %)	C	Ages 12 years and over for some indications	Same as topical corticosteroids and topical vitamin D3 analogs		Limited data on facial vitiligo response is good, but atrophy was noted
Oral therapies					
Oral vitamin D	NA	None	Overdose associated with hypercalcemia and kidney stones (i.e. symptoms of hypervitaminosis D)		Dosing should be based on recommended daily amount and presence of insufficiency/ deficiency (consult IOM & AAP recommendations)
Oral folic acid	NA	Supplementation pre- and post-partum is advised			US RDA dosing recommended
Oral vitamin B12	NA	Supplementation or nutritional counseling in vegetarians may be needed			US RDA dosing recommended
Oral vitamin C	NA	None			US RDA dosing recommended

Table 2 continued

Drug	FDA pregnancy class	Age restrictions (US FDA labeling)	Side effects	Labeled warnings	Author comments
Gingko biloba	NA	Inadvisable in pregnant women and limited data under the age of 18 years	Reduced platelet activity		While a clinical trial of this agent has found it to be successful at slowing disease progression in adults, safety in childhood has not been established
Phototherapy					
UVB/NB-UVB	NA	None	Phototoxic reactions, long-term risk of skin cancer, discomfort, erythema	Informed consent needed (check manufacturer information for class of device)	Limit to children who are able to comply [76]
PUVA	C	Not recommended for children	Phototoxic reactions, erythema, long-term risk of skin cancer, pruritus, eye damage, nausea, discomfort	Informed consent needed (check manufacturer information for class of device)	Rare usage in current day and age
Laser therapy					
308-nm laser	NA	None	Erythema, blistering, erosions	Informed consent needed (check manufacturer information for class of device)	Limit to children who are able to comply

AAP American Academy of Pediatrics, *IOM* Institute of Medicine, *NA* not available, *NB-UVB* narrowband UVB, *PUVA* psoralens and UVA, *RDA* recommended dietary allowance

fair-skinned patients [26]. Localized side effects of topical steroids include atrophy, striae, telangiectases, perioral dermatitis, and glaucoma (when applied in the periocular location) [30]. Systemic absorption is of concern, especially in smaller children with potential for hypothalamic–pituitary–adrenal axis suppression/iatrogenic Cushing's syndrome [31–33].

Risk of atrophy is highest on the face and in intertriginous locations. Pre-teens and teens may be at greatest risk of striae. In split face and other studies, high potency topical corticosteroids performed well in pediatric patients with lesions on the head and neck, but not necessary better than tacrolimus [34, 35]. Steroid-sparing topical agents should also be considered for long-term use on the body, as topical pimecrolimus has been shown to repigment vitiliginous skin at a comparable rate to clobetasol in split body studies [36]. In addition, steroid acne can develop in adolescents as a result of application of corticosteroids on the head, neck, upper arms, chest and back. Of note, oral zinc supplementation has been tried in a small trial and noted to enhance the effectiveness of topical corticosteroids, but larger studies are needed [37]. Steroid phobia by parents and patients does occur and requires good education and on-going reassurance of the parties involved [38, 39].

3.2 Topical Calcineurin Inhibitors

Calcineurin inhibitors block the differentiation of T cells through the nuclear factor kappa-light-chain-enhancer of activated B cells (NF KB) pathway. Topical calcineurin inhibitors (tacrolimus 0.03 %/0.1 % and pimecrolimus 1 %), FDA approved for the treatment of atopic dermatitis, have been reported to be safe and efficacious [40] in pediatric vitiligo, especially on the head and neck, in patients with disease for <5 years, on intertriginous and genital skin, in facial segmental disease, in dark patients [41, 42], on lesions on the head and neck (especially segmental facial type) [43], and in patients with a Fitzpatrick skin type of 3–4 [32, 43]. Children are nine times as likely as adults to get a good response [44]. They are less effective in acral lesions and in adults [41, 43]. Avoidance of application over atypical pigmented lesions is recommended [45]. Absorption through intact skin is felt to be very limited in patients with vitiligo and is limited even in pediatric atopic dermatitis where the skin barrier is impaired [46–48]. Twice-daily application is required for optimal results [49]. The theoretical black box warning of potential skin cancer and lymphoma risk recommends avoidance of usage under the age of 2 years and as a second-line agent to corticosteroids in atopic dermatitis; however, topical calcineurin inhibitors

are deemed to be first-line treatment for facial vitiligo of childhood by the Vitiligo European Task Force [5]. Application site burning and erythema may occur, but usually resolves within the first few days and does not recur. Tacrolimus is pregnancy category C and is not recommended in pregnant teenagers. Occlusion, preceding microdermabrasion [50], sunlight, and associated 308-nm laser or NB-UVB phototherapy have all been reported to enhance treatment response to calcium inhibitors [51, 52]. In children who cannot tolerate NB-UVB treatment for whatever reason, the use of topical tacrolimus 0.1 % may result in comparable efficacy in repigmentation [38]. Topical calcineurin inhibitors have been labeled by the United States Food and Drug Administration (US FDA) with a black box warning regarding theoretical skin cancer and/or lymphoma risk. Two recent articles have reviewed the topic of usage in atopic dermatitis patients [53, 54] (or equivalent once references amended according to earlier changes). No similar long-term data has been published looking at vitiligo patients, therefore, the atopic dermatitis data is herein reviewed. The PEER study (Pediatric Eczema Elective Registry) enrolled 7457 children with a total of 26,792 person-years. As of May 2013, two leukemias, one osteosarcoma and two lymphomas had been reported, with no statistical elevation over the SEER-based population data [53]. Siegfried et al. have performed an exhaustive review of the literature regarding lymphoma risk in children treated with topical calcineurin inhibitors. The reader may find this review beneficial. The data supports the likely safety of pimecrolimus in children with atopic dermatitis and similar but not as comforting data in tacrolimus [54].

3.3 Topical Vitamin D

Calcipotriene is a vitamin D analog thought to enhance melanocyte function. Calcipotriene monotherapy is ineffective for vitiligo but is adjunctively beneficial when combined with topical corticosteroids (e.g., betamethasone) for facial and or body vitiligo in childhood [44, 55, 56], or NB-UVB. Transient skin irritation may occur with use of calcipotriene. The addition of calcipotriene may reduce atrophy risk with topical corticosteroids [57]. A fixed combination of betamethasone and calcipotriene once daily has also been described as efficacious for facial vitiligo in childhood [58].

3.4 Oral Vitamin Supplementation

We generally recommend children with vitiligo be kept on a pediatric vitamin supplement with US recommended dietary allowance (RDA) dosages. We do not believe the safety of high-dose vitamin ingestion has been established in children and do not supplement young children beyond standard vitamins available over-the-counter. For children requiring supplementation, refer to the appropriate practitioner for dosage and monitoring (see Sects. 2.1, 2.2).

3.4.1 Vitamin D

Vitamin D levels appear to be insufficient or deficient in some patients with vitiligo who have associated polyautoimmunity (i.e., thyroid disease, type 1 diabetes mellitus), this association being noted in patients ages 3 and over. Maintenance of normal vitamin D levels and supplementation where appropriate is therefore ideal in the pediatric vitiligo patient and can be accomplished via screening and supplementation as per Institute of Medicine (IOM) and American Academy of Pediatrics (AAP) guidelines and continued through adulthood [13, 58–61]. While prolonged high-dose vitamin D supplementation in adulthood has been proven beneficial in some vitiligo patients, the same has not been shown in children [62].

3.4.2 Folic Acid and Vitamin B12

Antioxidant vitamins such as folic acid and B12 are thought to reduce oxidative damage and perhaps contribute to melanin biosynthesis in melanocytes in patients with vitiligo. Patients with vitiligo have lower levels of vitamin B12 than control subjects, with pernicious anemia being reported in 3.7 % of patients in a cohort of patients aged 5–66 years and has not been found to vary between adults and children [63]. Pregnancy may alter the vitamin needs and folic acid deficiency can be associated with fetal neural tube defects; therefore, female adolescents with vitiligo should be advised to seek prenatal care and begin vitamin supplementation including folic acid prior to pregnancy [64]. Supplementation of folate is common with phototherapy while B12 is supplemented in the setting of deficiency (e.g., pernicious anemia) and/or insufficiency and may be needed in vegetarians [65, 66]. Hematology should be consulted for dosage of folate and B12. However, US RDA dosage for children ranges from 65 μg/day for children aged 0–6 months to 400 μg/day for teenagers 14 years and over and, for B12, 0.4–2.4 μg/day [67].

3.4.3 Gingko Biloba

Vitiligo disease activity was reduced in a solitary, never repeated trial of 11 participants aged 18–35 years taking 60 mg gingko biloba twice daily for 2 months [68]. Usage in childhood vitiligo has not been evaluated but a study evaluating the efficacy for migraines showed modest benefit. Long-term safety in children has not been evaluated [69]. Gingko biloba during pregnancy and lactation is deemed unsafe due to antiplatelet activity of gingko [70].

Fetal mice do develop anomalies when exposed to gingko, including syndactyly; therefore, usage in small children (age categories 1–2, possibly 3) is possibly unsafe [71].

3.5 Camouflage

Cosmetic camouflage can be used at any age and will provide welcome avoidance of comments and stares. Recent data has shown cosmetic camouflage improves quality of life for children with facial lesions including vitiligo [72]. Dihydroxyacetone, the self-tanner, has also been associated with reasonable cosmesis in medium-toned patients with vitiligo [73].

3.6 Phototherapy

3.6.1 Generalized Phototherapy

Psoralens and UVA (PUVA) were once the gold standard of vitiligo phototherapy. Childhood PUVA is now rarely used due to intolerance of medication, poor compliance with ocular protective gear, difficulties in sun avoidance for 24 h, claustrophobia in small phototherapy booths, and potential long-term skin cancer risk. PUVA is a teratogen and a cutaneous mutagen and is not used in pregnancy [74].

NB-UVB has replaced PUVA because it has less cancer risk in adults and does not require ocular protection after the completion of the sessions [75]. Pediatric patients are statistically more likely to achieve 75 % repigmentation than adults (37 vs 15.6 %). Therefore, phototherapy is a good therapy for widespread pediatric vitiligo [76]. Efficacy in childhood is twofold with stabilization of disease being the first endpoint, achieved in 80 % of children, and repigmentation being the secondary endpoint for children with generalized vitiligo [77, 78]. In children, there is a lack of long-term data on the safety and appropriate cumulative dose of UV therapy [79], and it is proposed that UVB phototherapy be continued for 12 months in younger children and be discontinued after 6 months if no clinical improvement is noted [80]. In a recent study of 77 children aged 16 years and under treated with NB-UVB for vitiligo, 47 % demonstrated good response with minimal side effects. Only 14.3 % of patients reported side effects [81]. Additionally, in our offices we generally do not perform NB-UVB in a booth on children under 6 years of age due to the difficulty younger children have standing still. Usage in children of very light skin tone (Fitzpatrick phototype I) is not usually performed [5] due to intolerance of therapy and the minimal appearance of the lesions in this skin type. Adult patients with vitiligo who have received phototherapy have a higher risk of skin cancer than vitiligo patients who have not received phototherapy [82].

3.6.2 Laser Phototherapy

Excimer laser (308 nm) and excimer lamp therapy are safe and effective for both adults and children for the treatment of vitiligo and are especially beneficial in the first 5 months of segmental disease [83, 84]. However, while the authors indicate that the patients enrolled were aged 4–55 years, they do not section off pediatric response. Reports of excimer laser have been largely in adults but some case series have characterized the pediatric treatment in a limited set of patients. A case series of pimecrolimus and excimer laser demonstrated that at 30 weeks repigmentation was superior (71 vs 50 % with 50–100 % repigmentation) with the additional pimecrolimus; however, practitioners must be aware of the warning label on pimecrolimus before considering this combination [85]. The side-effect profile is desirable as the risks are only localized, leading some authors to advocate 308-nm laser as the ultraviolet light source of choice in childhood vitiligo [86]. In addition, the child will not have to endure the claustrophobia of the phototherapy booth.

3.7 Depigmentation Therapy

For those patients with extensive depigmentation (>30 %), or those who have extensive disease on a cosmetically noticeable area that has been recalcitrant to all therapeutic options for >5 years, depigmentation therapy can be considered. This involves the use of 20 % monobenzyl ether of hydroquinone (MBEH), a topical agent that destroys melanocytes. This results in even skin tone by depigmenting the skin unaffected by vitiligo. The use of this agent must be a last resort due to a number of issues. In those ethnicities with darker skin types, it can result in changes in perceived race. Individuals of all ages who would undergo depigmentation require psychological/psychiatric screening and some individuals need on-going psych support throughout the process. The physician interested in this therapy is directed to Grau and Silverberg [87] for some psychological screening parameters.

The depigmentation process is also long, requiring daily application of MBEH. Patients must use sunscreen daily for the rest of their lives to prevent follicular repigmentation. In addition, this therapy is not always 100 % efficacious, thus, patient expectations must be managed. Given these issues, it is important that the candidate for MBEH is mature and psychiatrically and emotionally stable, therefore this therapy should be reserved for the older, mature adolescent vitiligo patient [87].

3.8 Grafting for Pediatric Vitiligo

Autologous grafting is a difficult subject and is a technique not commonly performed in the United States.

When this technique is desired it is best to refer to a physician with experience in the technique(s). There are a few available techniques that have been described. Grafting is reserved for lesions that are stable in patients who have stable disease, that is, whose depigmentation is not progressing in such a way as to destroy the pigmentation in the graft site. One technique is punch grafting normally pigmented skin into the areas of depigmentation, which can cause a cobblestoning effect and is best paired with NB-UVB or excimer to enhance even repigmentation [88]. A second is split-thickness skin graft and the most recent is melanocyte transfer grafting. Each technique may be painful, may potentially cause scarring, or may produce mottled pigmentation in the donor or the recipient sites. The melanocyte graft technique is a recent technique and a theoretical cancer risk exists due to the use of growth factors to enhance the melanocyte growth [89]; however, no reports of melanoma at the site of grafting have appeared in the literature. Greater than 90 % repigmentation was achieved in 81.3 % of patients in one study pairing NB-UVB and grafting [90].

3.9 Overview of Age Category-Based Therapeutic Concerns

Group 1 (infants and toddlers) is uncommonly affected by vitiligo. Low vitamin D levels in association with vitiligo have not been reported under the age of 3 years. This may be due to supplementation of formula and the common supplementation of breast fed infants in the United States. Thyroid screen periodically is warranted in children with generalized vitiligo. Congenital hypothyroidism is part of the perinatal screen across the United States. In these younger children, lower potency topical agents are more advisable, including replacement of class II topical corticosteroids on the body with class III–IV agents (e.g., triamcinolone) and with topical class V–VI topical corticosteroid agents (with or without the addition of topical calcipotriene to limited surface area) for localized facial disease (excluding the eyelids). As with all age groups of children, steroid phobia by parents and children can occur and needs to be explored and overcome, where possible, through education [38, 39].

In group 2 (ages 4–8 years), judicious usage of 308-nm laser can be used with addition of NB-UVB phototherapy toward the latter years, school/after-school activities permitting.

In group 3 (ages 9–12 years), all therapies are reasonable, but two issues arise. First, pre-teens and group 4 (teens) are at greater risk of striae and therefore careful avoidance of potent topical corticosteroids in these age groups, especially in intertriginous locations and thighs, is desirable. Furthermore, the 9- to 12-years-old child is often NOT a willing participant, though they may regret lack of intervention as they age. As a result, therapy must not be foisted upon this group without careful explanation and assent. There is a need for frequent office visits to encourage compliance, which must be balanced with school and after-school activities. Psychological support becomes more necessary and cosmetic camouflage should be offered to groups 3 and 4.

Group 4 (teenagers) must be engaged in decision making and psychological screening should be offered, with referral to a psychiatric professional where needed. Chemical depigmentation can be offered in extensive cases for very mature teenagers.

4 Conclusion

Vitiligo is common in children, and is treatable. Evaluation of the patient and administration of therapy based on site and extent of disease is usual. Early onset of therapy works best in some settings, especially in segmental disease. Overall monitoring for concurrent health issues (e.g., thyroid disease) is very important in children to enhance health and repigmentation. Reassurance as to the low rate of genetic transmission can be given to the vitiligo patient and their family members.

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