Disorders of the Sebaceous and Sweat Gland

8

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Clinical Features of Acne Vulgaris and Its Variants

Acne Vulgaris

The clinical presentation of acne vulgaris consists of open and closed comedones as well as inflammatory erythematous papules and pustules. It is typically categorized as mild, moderate, or severe in terms of severity (see Figs. 8.1, 8.2, and 8.3). Nodular acne signifies the presence deeper inflammatory nodules. Both non-inflammatory and inflammatory lesions are often seen in the same patient. While its age of onset is typically in adolescence, acne may begin in the pre-adolescent child beginning around 8 years of age. Upon resolution of acne lesions, patients may develop hyperpigmented or erythematous macules, as well as variable degrees of scarring.

Acne Fulminans

Acne fulminans is the most severe form of acne, and primarily affects adolescent boys. It is characterized by the abrupt development of nodular and suppurative acne lesions in the background of mild to moderate acne. Lesions affect the face, neck, chest, back, and trunk, and often develop into painful, friable ulcerated plaques with overlying hemorrhagic crust. Significant scarring is common. Systemic manifestations include fever, arthralgias, myalgias, hepatosplenomegaly, and malaise. The systemic findings of acne fulminans overlap with ***s***ynovitis, ***a***cne, ***p***ustulosis, ***h***yperostosis, and ***o***steitis (SAPHO) syndrome.

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Acne Conglobata

Acne conglobata is a severe form of nodular acne with eruptive onset in the absence of systemic manifestations. It can be seen as part of the follicular occlusion tetrad, along with dissecting cellulitis of the scalp, hidradenitis suppurativa, and pilonidal cysts. It may also be seen as part of PAPA syndrome, an autosomal dominant disorder caused by mutations in the *PSTPIP1* gene, characterized by sterile ***p***yogenic ***a***rthritis, ***p***yoderma gangrenosum, and ***a***cne conglobata. PAPASH syndrome includes sterile ***p***yogenic ***a***rthritis, ***p***yoderma gangrenosum, ***a***cne and ***s***uppurative ***h***idradenitis. Novel mutations in the *PSTPIP1* gene are also implicated [1].

Drug-Induced Acne

Drug-induced acne typically presents as monomorphous papules and pustules, and can be secondary to several medications. In the pediatric population, the most common cause is systemic or ultrapotent topical corticosteroids, and less often lithium, isoniazid, and phenytoin. Other possible agents include cyclosporine, azathioprine, and phenobarbital, as well as accidental exposure secondary to testosterone-containing agents.

Specific Investigations

For diagnosis
Endocrine evaluation (in children under 7 years and adolescents when other signs of hyperandrogenism are present)
For treatment
With isotretinoin: liver function tests, lipid profile, β-hCG (females of childbearing age)
With dapsone: complete blood count (CBC) with differential, glucose-6-phosphate dehydrogenase (G6PD) level

J.M.C. Teng et al. (eds.), *Therapy in Pediatric Dermatology*, DOI 10.1007/978-3-319-43630-2_8

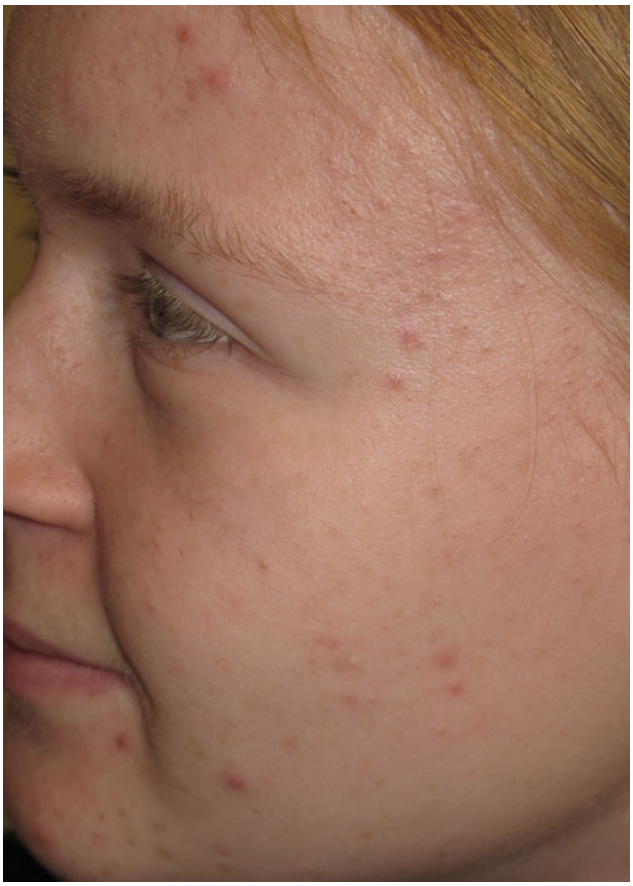

Fig. 8.1 A patient with papules and closed comedones consistent with mild acne

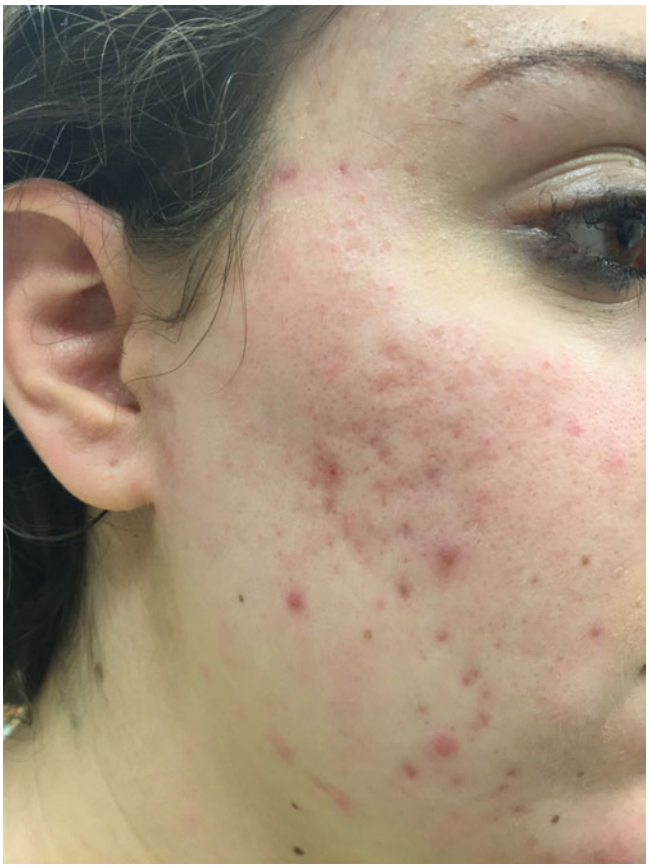

Fig. 8.2 Combined inflammatory papules with closed comedones and scarring in a patient with moderate acne

Laboratory evaluation is not required in the majority of patients with acne. In patients with a suspected endocrine abnormality, such as polycystic ovarian syndrome (PCOS), congenital adrenal hyperplasia, an adrenal or gonadal tumor, baseline evaluation should be performed. Screening tests include serum total and free testosterone, dihydroepiandrosterone-sulfate (DHEA-S), and 17-hydroxyprogesterone. Lutenizing hormone (LH) and follicle-stimulating hormone (FSH) may be obtained as well. In females with PCOS, serum free testosterone typically ranges from 100 to 200 ng/dl, and may be associated with an increased LH/FSH ratio (>2–3:1). Congenital adrenal hyperplasia is usually associated with 17-hydroxyprogesterone levels of >3 ng/ml [2]. Serum testosterone >200 ng/dl raises concern for an ovarian tumor, while serum DHEA-S levels of >8,000 ng/ml may be secondary to an underlying adrenal tumor.

In patients undergoing treatment with isotretinoin, baseline laboratory tests include liver function tests and a serum lipid panel. Repeat laboratory testing should be performed at monthly intervals when the lipid response to isotretinoin is established [3]. Females of childbearing potential must have two negative pregnancy tests within a month prior to starting isotretinoin therapy, then monthly during treatment and for 1 month after cessation of therapy.

Oral dapsone therapy can cause hemolytic anemia and, uncommonly, agranulocytosis, thus warranting periodic CBCs. Its use is contraindicated in those with G6PD deficiency, and levels of the enzyme should be checked prior to starting treatment with dapsone.

Discussion of Treatment Modalities

Topical Retinoids

Topical retinoids are first-line agents in acne treatment. They should be applied to the entire acne-prone area in order help prevent future acne lesions. The most common side effect is skin dryness and irritation, especially when used in combination with other topical agents. To minimize irritation, the retinoid can be applied every 2–3 days, and increased to daily as tolerated. Additionally, moisturizer can be applied directly over top of the medication.

Three topical retinoids are available; tretinoin, adapalene, and tazarotene. Tretinoin is photolabile and susceptible to oxidation by benzoyl peroxide. It should be applied at night and should not be used at the same time of day as benzoyl peroxide. Microsphere formulations do not have these restrictions, nor does adapalene or tazarotene.

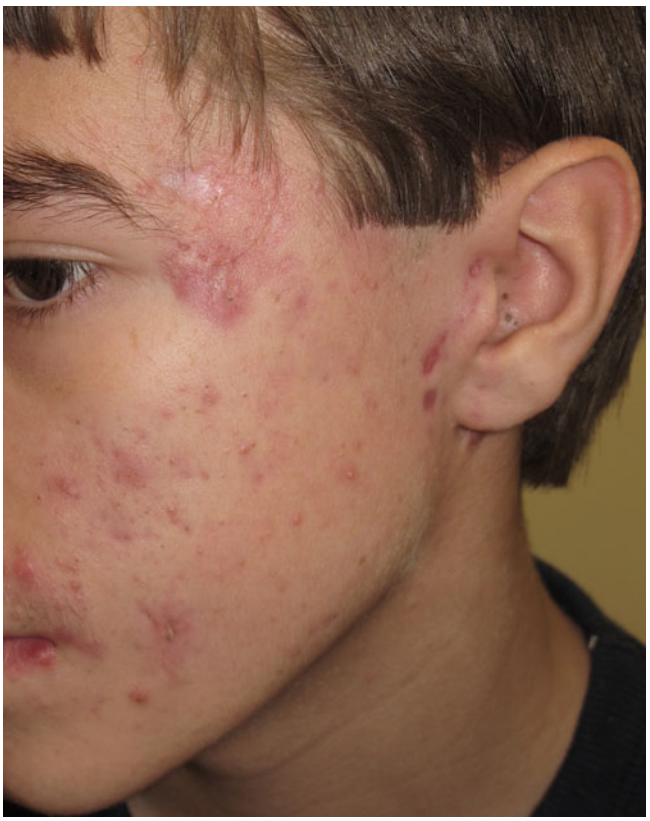

Fig. 8.3 Severe acne in a patient with numerous nodules, scarring, as well as open comedones in the ears

Table 8.1 First line therapies

Acne type	Treatment
Mild	Benzoyl peroxide or
	Topical retinoid or
	Topical combination therapy[a]
Moderate	Topical combination therapy[a] +/– oral antibiotic
Severe	Topical combination therapy[a] +/– oral antibiotic or
	Isotretinoin (if severe nodular or scarring)+/– oral steroid

Prescribe separate products or fixed dose combinations including adapalene/BP, clindamycin/BP, clindamycin/tretinoin + BP, erythromycin/BP, tretinoin + BP
BP benzoyl peroxide
[a]Topical combination therapy = retinoid + BP +/– topical antibiotic

Tretinoin and adapalene are labeled pregnancy category C, while topical tazarotene is pregnancy category X, and patients of childbearing potential should be counseled accordingly.

Topical Antimicrobials

Benzoyl peroxide is an effective treatment alone or when used in combination therapy. Unlike other antimicrobials, microbial resistance has not been reported to benzoyl peroxide. It is available in concentrations from 2.5 % to 10 % and

Table 8.2 Second line therapies

Acne type	Treatment
Mild	Add topical retinoid or BP (if not already using) or
	Alternate topical combination therapy* or
	Azelaic acid or salicylic acid or dapsone gel
Moderate	Alternate oral antibiotic + alternative retinoid
	+/– BP or
	Combined oral contraceptive or spironolactone (for females) or
	Isotretinoin
Severe	High-dose oral antibiotic + alternate topical retinoid + BP or
	Combined oral contraceptive (for females) or
	Dapsone or
	Etanercept or systemic immunosuppressive (rarely used)

Level of evidence	
Topical retinoids	A
Benzoyl peroxide (BPO)	B
Combination topical retinoid + BPO	A
Topical dapsone 5 % gel	A
Topical azelaic acid	B
Oral antibiotics	A
Isotretinoin	A
Oral contraceptives	A
Spironolactone	A
Oral dapsone	A
Oral corticosteroids	C

Table 8.3 Third line therapies

Chemical peels – A (level of evidence)
Laser therapy – B (level of evidence)
Intralesional steroid injections – E (level of evidence)

in several formulations, including washes, creams, gels, lotions, soap, foams, and pads. Benzoyl peroxide can bleach towels, sheets, and clothing, and cause skin erythema and irritation. A combination adapalene 0.1 %/benzoyl peroxide 2.5 % topical gel is available.

Other topical antibiotics include clindamycin and erythromycin, which are available as gels, solutions, and pledgets. However, antibiotic resistance to these agents is increasing, so monotherapy with these agents is not recommended.

Other Topical Agents

Azelaic acid cream or gel has inhibitory properties against *P. acnes* and can be used to treat inflammatory acne. It has the additional benefit of providing modest improvement to the post-inflammatory hyperpigmentation from prior acne lesions.

Topical dapsone 5 % gel has anti-inflammatory and antimicrobial properties and can also be used for inflammatory acne. The most common adverse event is skin irritation or dry-

ness, and it can cause a temporary orange-yellow discoloration of the skin and hair if used concurrently with benzoyl peroxide. Studies have shown minimal absorption of topical dapsone, and it is safe in those with G6PD deficiency [4]. There is one report of methemoglobinemia attributed to topical dapsone use [5].

Salicylic acid is present in many over-the-counter acne treatments. It can be effective in mild comedonal acne. Several formulations in concentrations up to 2% exist, including gels, creams, lotions, foams, solutions, and washes. It is typically well tolerated, but can cause erythema and xerosis.

Oral Antibiotics

Oral antibiotics are used in combination with topical agents as first-line therapy for moderate papulopustular acne. Doxycycline and minocycline are used most commonly, and given at doses of 100 mg daily to twice daily. Once-daily extended-release formulations are available. The most common side effect is gastrointestinal upset, especially with doxycycline. Esophagitis can also occur. Doxycycline can cause phototoxicity. Pseudotumor cerebri has been associated with all of the tetracyclines, especially if combined with isotretinoin. Tetracyclines can also cause permanent discoloration of developing teeth. Doxycycline and tetracycline are thus contraindicated in children under the age of 8 years. Minocycline is indicated for those 12 years and older. It can cause dizziness, or accumulate in the skin, leading to bluish pigmentary changes. Minocycline can uncommonly lead to hypersensitivity reactions as well as various autoimmune conditions, including drug-induced lupus.

Macrolides are second-line antibiotics for inflammatory acne. Azithromycin is most often used, as *Propionibacterium acnes* resistance to erythromycin is exceptionally high. Azithromycin is variably dosed for acne, from 250 to 500 mg three times weekly to daily. In younger children, 5 mg/kg daily to three times weekly is used. Macrolides have many drug interactions, and a thorough medication history is warranted prior to treatment. Erythromycin is dosed at 500 mg twice daily. For younger children, a dose of 30–50 mg/kg/day, divided twice daily, is used. Gastrointestinal upset is very common, and an often limiting side effect.

Trimethoprim-sulfamethoxazole is sometimes used for recalcitrant acne or to treat secondary gram-negative folliculitis. Due to the numerous potential serious side effects, it is generally regarded as third-line treatment among antibiotics, and use should be limited. Dosing is weight-based in children, and patients are given 6–12 mg/kg of trimethoprim every 12 h up to the adult dose of one double-strength tab twice daily.

Isotretinoin

Oral isotretinoin is approved for patients with severe, nodulocystic acne refractory to treatment including oral antibiotics. It may also be used as first-line therapy in those with severe nodular acne at risk for scarring, or those with significant scarring.

Patients may start at a lower dose of isotretinoin (0.25–0.5 mg/kg daily) and titrated up to 1 mg/kg/day after 1 month. Treatment is continued until a cumulative dose of 120–150 mg/kg is reached. When used to treat acne fulminans, it is typically started concurrently with oral steroids to prevent flaring, with tapering of the steroids over a few weeks.

Isotretinoin is a potent teratogen, and females of childbearing potential must receive proper counseling and use two forms of contraception during therapy. Common side effects include xerosis, cheilitis, epistaxis, and myalgias. Dry eyes or blurred vision is sometimes reported. Isotretinoin can cause elevations in triglycerides and liver enzymes. Two possible associations link isotretinoin to inflammatory bowel disease and depression, although recent data does not support causality.

Oral Dapsone

In patients with recalcitrant nodular acne, or with contraindications to isotretinoin, oral dapsone is sometimes used at a dose of 100 mg daily.

Hormonal Therapy

Hormonal therapy is considered second-line therapy in female patients with acne, but can be used initially in those with noted perimenstrual flares or irregular periods. Oral contraceptives are the mainstay of hormonal therapy, and contraceptives containing progestins with lower androgen activity or anti-androgen activity are most effective. They are commonly used in adolescent girls, ideally after they have established menstrual cycles.

The most common side effects include nausea, vomiting, menstrual irregularities, weight gain, and breast tenderness. Rare adverse events include hypertension and thromboembolism. This rate is higher in smokers and in those >35 years of age. Decreased bone density is a concern, so low-dose estrogen contraceptives are not recommended.

Spironolactone is a second-line hormonal treatment for acne, which has additive effects when combined with oral contraceptives. Doses range from 25 to 200 mg/day divided into twice-daily dosing. The most common side effects include breast tenderness, headache, and menstrual irregularities. Postural hypotension is uncommon, and hyperkalemia is usually not seen in healthy females. It is not commonly used in younger adolescents.

Table 8.4 Third-line therapies

Third-line therapies
Third-line acne treatments include chemical peels (usually with glycolic or salicylic acid) [6] and laser therapy. Individual nodular lesions can be injected with triamcinolone in concentrations up to 2.5 mg/cc

Neonatal Acne

Neonatal acne, considered by some to be synonymous with neonatal cephalic pustulosis, is seen up to 20 % of healthy newborns. It is characterized by small, inflamed papules and pustules in the absence of comedones, favoring the cheeks and nasal bridge, but often extending to the forehead, chin, neck, and upper trunk. Lesions usually appear by 2 weeks of age and resolve within the first few months of life. While some support a pathogenetic role of *Malassezia* yeast, this remains unproven and debated.

Specific Investigations

- None

Table 8.5 First-line therapies

First-line therapies
Observation

Neonatal acne is a self-limited condition and treatment is usually not required, unless extensive or persistent.

Table 8.6 Second-line therapies

Second-line therapies
Topical imidazole – E (level of evidence)

When treatment is required, the most commonly used agents are topical imiadazole creams, including econazole and ketoconazole [7]. These agents have anti-inflammatory properties and target the *Malassezia* yeast, which may provide additional improvement.

Table 8.7 Third-line therapies

Third-line therapies
Low potency topical steroids – E (level of evidence)

Improvement of neonatal acne with low-potency topical steroids has been reported and can be tried in those who fail topical imidazole therapy.

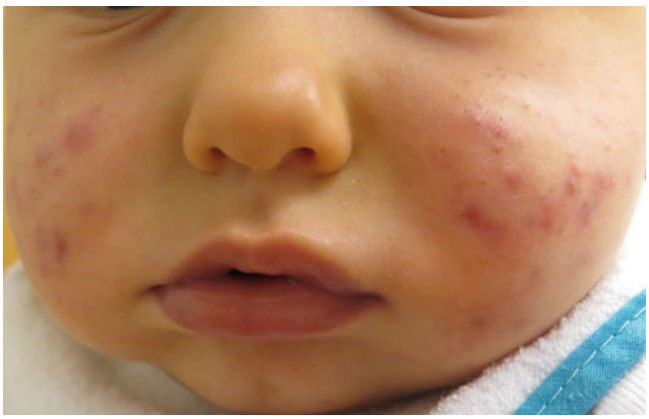

Fig. 8.4 Infantile acne with many inflammatory papules and open comedones on the cheeks

Infantile Acne

Infantile acne typically presents later than neonatal acne, at 3–12 months of age. It is most often characterized by prominent comedones with variable inflammatory lesions (see Fig. 8.4). Deep nodules are occasionally seen. Even with a minimal inflammatory component, infantile acne commonly results in scarring, up to 25 %. Infantile acne typically resolves within 1–2 years.

Specific Investigations

- None

No workup is typically required for infantile acne, unless secondary signs of hyperandrogenism are noted, and then a complete hormonal workup is indicated. Testing includes a serum total and free testosterone, DHEA-S, 17-OH progesterone, LH and FSH, and bone age.

Table 8.8 First-line therapies

Topical retinoid – E (level of evidence)
Topical antimicrobial – E (level of evidence)

Infantile acne is often treated, due to the potential for scarring. Mild comedonal acne is usually treated with tretinoin cream or adapalene gel. When present, mild inflammatory lesions are treated with a topical antimicrobial agent, such as benzoyl peroxide, erythromycin, or clindamycin. While not specifically studied in younger children, standard acne treatments have been reported to be safe and effective in infants [8]. Topical agents should be applied sparingly, and started thrice weekly to avoid excess irritation.

Table 8.9 Second-line therapies

Second-line therapies
Oral antibiotic – E (level of evidence)

Infants with more severe acne, especially those with a prominent inflammatory component, may be treated with an oral antibiotic, usually erythromycin.

Table 8.10 Third-line therapies

Third-line therapies
Oral isotretinoin – E (level of evidence)

In infants with severe nodular acne or with significant scarring, oral isotretinoin can be used, although this is rarely warranted.

Mid-childhood Acne

The onset of acne in mid-childhood (between 1 and 7 years of age) is unusual due to the minimal androgen production at this time. Its presence raises concern for possible pathologic hyperandrogenism, as can be seen in congenital adrenal hyperplasia, central precocious puberty, polycystic ovarian syndrome (PCOS), and gonadal or adrenal tumors. A thorough physical examination for signs of virilization and careful review of growth charts and bone age are required. If any abnormalities are noted, a complete endocrine evaluation is indicated.

Specific Investigations

- Serum total and free testosterone
- DHEA-S
- 17-OH progesterone
- LH and FSH
- Bone age

As noted above, screening tests for an endocrinologic abnormality include serum total and free testosterone, dihydroepiandrosterone-sulfate (DHEA-S), and 17-hydroxyprogesterone [9]. Lutenizing hormone (LH) and follicle-stimulating hormone (FSH) may be obtained in females with suspected hyperandrogenism. In mid-childhood acne, a bone age should be obtained to screen for precocious puberty.

Table 8.11 First-line therapies

Management of any underlying endocrine abnormality
Topical retinoid – E (level of evidence)
Topical benzoyl peroxide – E (level of evidence)

In young children with an underlying endocrine abnormality, treatment should first be directed at hormone regulation through an endocrinologist. In treatment of the acne, first-line therapy for mid-childhood acne is similar to infantile acne. Mild comedonal lesions can be treated with a topical retinoid, while mild inflammatory acne can be treated with topical benzoyl peroxide [8].

Table 8.12 Second-line therapies

Second-line therapies
Oral antibiotic – E (level of evidence)

Children with moderate inflammatory acne in childhood can be treated with an oral macrolide such as erythromycin or azithromycin. Tetracyclines are contraindicated in this age group.

Table 8.13 Third-line therapies

Third-line therapies
Oral isotretinoin – E (level of evidence)

In children with a prominent nodular component or with significant scarring, oral isotretinoin can be considered.

Preadolescent Acne

Acne occurring at the onset of adrenarche, ages 7–12, is designated preadolescent acne. The incidence of acne in this age group may be on the rise due to an overall earlier onset of puberty in children, and more prolonged and irregular pathways through puberty. Lesions are typically confined to the T-zone of the central face, and comprised of closed comedones, although all lesions types can be seen. Endocrinologic workup is generally not indicated unless other abnormal clinical findings are present.

Specific Investigations

- None

Table 8.14 First-line therapies

Topical retinoid – A (level of evidence)
Topical benzoyl peroxide – B (level of evidence)
Combination topical retinoid + benzoyl peroxide – A (level of evidence)

Treatment of preadolescent acne is similar to that of typical adolescent acne. Since the majority of patients in this age range have mild comedonal acne, a topical retinoid is first-

line therapy. Of note, preadolescents are often not self-motivated to treat their acne, and so any treatment plan should take this into consideration and remain simple.

Table 8.15 Second-line therapies

Alternative topical retinoid – E (level of evidence)
Salicylic acid – E (level of evidence)

Second-line options for preadolescent acne include the use of an alternative topical retinoid or using a salicylic acid-containing product.

Table 8.16 Third-line therapies

Oral antibiotics – E (level of evidence)
Oral isotretinoin – E (level of evidence)

For patients with an early onset of moderate-to-severe acne, oral antibiotics and oral isotretinoin can be considered and used in a similar fashion as described for adolescent acne.

Periorificial Dermatitis

Periorificial dermatitis is an acneiform eruption that commonly occurs in infants and young children. The rash is characterized by small inflammatory papules and pustules grouped around the mouth, nose, and eyes, which may coalesce into scaling patches or plaques. Extrafacial involvement involving the trunk, extremities, and vulvar skin is occasionally observed. The rash is typically asymptomatic, but itching and burning can be associated. Some patients have a granulomatous form of periorificial dermatitis characterized by small pink or skin-colored flattened papules and micronodules, which can coalesce into plaques with a striking perioral demarcation. Some experts believe periorificial dermatitis is a form of childhood rosacea. Topical, systemic, or inhaled corticosteroids are often a precipitating factor [10, 11].

Specific Investigations

- History regarding prior topical and oral steroid use

Workup for perioral dermatitis involves obtaining a thorough history regarding prior corticosteroid use. Patients should be asked about topical, inhaled, and oral steroids, as all forms may be implicated. Biopsy is rarely required for diagnosis.

Table 8.17 First-line therapies

Discontinue topical steroids, when applicable
Topical metronidazole – A (level of evidence)
Topical clindamycin – B (level of evidence)

First-line treatment for perioral dermatitis first involves discontinuation of any steroids, if possible. Changing from a mask inhaler to a chamber inhaler for pulmonary steroids may help as well. Initial treatment also typically involves a topical antimicrobial or anti-inflammatory agent, including metronidazole cream or gel, or clindamycin gel or lotion [12, 13]. Mild cases may resolve simply by discontinuing the corticosteroid.

Table 8.18 Second-line therapies

Oral macrolide antibiotic – D (level of evidence)
Oral tetracyclines – A (level of evidence)

Second-line therapy is generally indicated for patients who do not respond to topical therapy after approximately 6–8 weeks of treatments, and involves the use of oral antibiotics [13]. Macrolide antibiotics, particularly erythromycin and azithromycin, are the most commonly used agents in younger children [14]. Tetracycline-class antibiotics can be used in older children. Long-standing cases may take several months to resolve, with periods of waxing and waning, requiring a more prolonged treatment course.

Table 8.19 Third-line therapies

Pimecrolimus cream – A
Tacrolimus ointment – E
Sodium sulfacetamide lotion – E

Topical tacrolimus ointment and pimecrolimus cream have also been used to treat periorificial dermatitis, especially when there is a prominent dermatitis component, with mixed reports of efficacy. Sodium sulfacetamide lotion or wash was reported to be of use in one case, although was used concurrently with a low-potency topical steroid [15].

Childhood Rosacea

Rosacea is most commonly seen in adults, and is generally considered rare in young children. However, its true incidence may be higher, as other conditions more commonly seen in children, such as periorificial dermatitis and idiopathic facial aspeptic granuloma, may actually be variants of rosacea. Four subtypes of rosacea have been described: papulopustular, telangiectatic, granulomatous, and ocular. The papulopustular variant is most common in children.

Specific Investigations

- Ophthalmologic exam if ocular rosacea is suspected

A diagnosis of childhood rosacea is typically made clinically without further workup required. However, patients with ocular complaints such as dryness or redness should be referred to ophthalmology for evaluation and treatment.

Table 8.20 First-line therapies

Topical antibiotics – A (level of evidence)
Azelaic acid cream – A (level of evidence)
Niacinamide – B (level of evidence)

Treatment of childhood rosacea is similar to that of perioral dermatitis. First-line therapy includes topical antimicrobial and anti-inflammatory agents such as metronidazole and azelaic acid [16, 17]. Topical niacinamide can also be used for its effect on the associated erythema of rosacea [18]. Of note, while numerous studies have shown the efficacy of various treatments for rosacea in adults, these studies have not been reproduced in the pediatric population, likely due in part to the uncommon incidence of rosacea in children.

Table 8.21 Second-line therapies

Oral macrolide antibiotics – B (level of evidence)
Oral doxycycline– A (level of evidence)

Second-line treatment for resistant or extensive cases includes oral antibiotics. In younger children, erythromycin or azithromycin is typically used and has been shown to be effective [19]. Tetracyclines, such as doxycycline, are often used in children 9 years of age and older [20].

Keratosis Pilaris

Keratosis pilaris is a common disorder affecting up to 20 % of children [21]. Small, dry, rough, follicular-based papules with variable erythema are distributed symmetrically, most commonly over the extensor surface of the upper arms and cheeks, with lesser involvement of the thighs, buttocks, distal extremities, calves, and trunk. Lesions are typically asymptomatic, except for the pruritus noted when lesions are dry and inflamed. The disorder is often associated with ichthyosis vulgaris and atopy. Improvement with age occurs in a minority of patients, particularly in regard to facial involvement.

Specific Investigations

- None

Table 8.22 First-line therapies

First-line therapies
Emollients

Treatment for keratosis pilaris is often ineffective and does not change the natural course of the disorder. First-line therapy consists of emollients, which may result in some textural improvement of the skin.

Table 8.23 Second-line therapies

Topical keratolytics – D (level of evidence)
Topical retinoids- B (level of evidence)

In older children, second-line therapy consists of topical retinoids or keratolytics, including urea, glycolic acid, ammonium lactate, and salicylic acid, although they may all cause skin irritation [22, 23]. Those who experience improvement typically experience recurrences when medication is discontinued.

Table 8.24 Third-line therapies

Topical steroids – D (level of evidence)
Laser therapy – B (level of evidence)

Topical steroids should be reserved for inflamed lesions and used for short periods of time only. Parents must be counseled regarding the inability of topical steroids to clear the skin lesions, and importance of avoiding prolonged use.

In older teenagers who are particularly bothered by keratosis pilaris, laser therapy can be considered [24].

Pseudoacne of the Nasal Crease

Pseudoacne of the nasal crease is characterized by milia, cysts, and comedones along the transverse nasal crease, a horizontal anatomical demarcation line between the alar and triangular cartilages at the lower third of the nose. It typically affects pre-pubertal children and is more common in those with atopy and an "allergic salute."

Specific Investigations

- None

Table 8.25 First-line therapies

First-line therapies
Surgical expression – E (level of evidence)

Table 8.26 Second-line therapies

Topical retinoids – E (level of evidence)
Benzoyl peroxide – E (level of evidence)

While no treatment is required, first-line therapy involves surgical expression of open comedones.

Second-line therapy consists of topical retinoids and benzoyl peroxide, which are not consistently effective [25].

Demodicosis

Demodex (*D. folliculorum* and *D. brevis*) are commensal mites residing in the pilosebaceous units of humans. Young children typically have few, if any, mites, with increasing colonization with age. However, immunocompromised children are at increased risk of develop demodex colonization and subsequent folliculitis. There are also rare reports of this entity in healthy children. Demodex folliculitis presents as small erythematous papules and fine scale on the face, which can resemble periorificial dermatitis.

Specific Investigations

- Direct microscopy

Diagnosis can be established by direct microscopy of the follicular contents scraped onto a glass slide and examined under immersion oil. Biopsy is occasionally required for diagnosis.

Table 8.27 First-line therapies

Permethrin cream – E (level of evidence)
Metronidazole gel – E (level of evidence)
Sodium sulfacetamide – E (level of evidence)

First-line treatment options include permethrin 5 % cream, metronidazole 1 % gel, and sodium sulfacetamide 10 % – sulfur 5 % formulation [26].

Table 8.28 Second-line therapies

Alternative topical agent – E (level of evidence)
Combination therapy – E (level of evidence)

Response to therapy of demodex folliculitis is variable. Oftentimes, one must try multiple different modalities among permethrin cream, metronidazole gel, and sodium sulfacetamide to obtain a response, although children tend to respond faster than adults [26]. Combination therapy with these agents may also be required.

Table 8.29 Third-line therapies

Third-line therapies
Oral ivermectin – E (level of evidence)

In patients who fail to respond to multiple topical agents, or who have extensive involvement, oral ivermectin may be required at either a single dose of 200 μg/kg or with weekly doses until resolution [27].

Idiopathic Facial Aseptic Granuloma

Idiopathic facial aseptic granuloma (IFAG; aka pyodermite froide du visage) is characterized by one or more persistent, asymptomatic, inflammatory nodules, most commonly located on the cheek in young children. Lesions are typically red to purple, slightly rubbery in consistency, ranging widely in size from 3 to 25 mm. Lesions are most commonly solitary, although some patients have two or three lesions. It can be associated with chalazion, and some consider this entity a variant of rosacea.

Specific Investigations

- Biopsy

Diagnosis is primarily made upon skin biopsy, which will rule out other possible entities including acne, Spitz tumor, pyogenic granuloma, pilomatricoma, and infections such as leishmaniasis and cat scratch disease. Histologic findings include granulomatous inflammation in the dermis comprised of lymphocytes, histiocytes, neutrophils, and giant cells.

Table 8.30 First-line therapies

Observation
Refer to ophthalmology if chalazion noted

Treatment is often unnecessary, as lesions tend to resolve spontaneously, although this may take several months.

Table 8.31 Second-line therapies

Oral antibiotics – E (level of evidence)
Topical metronidazole cream – E (level of evidence)

When treatment is initiated, macrolide antibiotics such as azithromycin, erythromycin, and clarithromycin are most often used. Topical metronidazole cream has also been used. Efficacy for all treatments is variable [28].

Table 8.32 Third-line therapies

Incision and drainage
Excision

Third-line therapy includes incision and drainage, or surgical excision for persistent cases.

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