

This is a text version of a podcast from PedsCases.com on “**Acne**.” These podcasts are designed to give medical students an overview of key topics in pediatrics. The audio versions are accessible on iTunes or at www.pedsCases.com/podcasts.

Approach to Acne – Part 1

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Hello, and welcome to PedsCases!

This is the first of a 2-part series of podcasts discussing acne in pediatric patients. Acne is one of the most common skin complaints in children and almost all of us have personal experience with it to some degree. While it may seem like a minor problem to some, acne can have a significant impact on self-esteem and may reflect systemic illness. Prompt and effective management of acne can prevent life-long scarring and improve quality of life for children. After listening to this podcast, the learner should be able to:

1. Describe the epidemiology, etiology, and pathogenesis of acne.
2. Recognize the clinical presentation of acne in neonates, infants, children, and adolescents.
3. Distinguish between mild, moderate, and severe acne.
4. Recognize the complications of acne.

Part 2 of this series will discuss different treatment considerations for preadolescent and adolescent acne.

Pathophysiology

Let's start by reviewing some basic information about acne in pediatric patients. *Acne vulgaris*, or “common” acne, is most often seen in the adolescent population. Its prevalence is estimated to be between 70-87% in children 12 years of age or older (1) and affects 40 to 50 million individuals each year in the United States (2). Adolescent acne usually presents at the onset of puberty, and may be the initial sign that puberty is starting (1,2). However, acne can present in pediatric patients of any age and there are diagnostic and treatment considerations for each age category.

Let's talk about the factors that contribute to acne and the disease process itself. Acne is considered a disease of the “pilosebaceous” unit, a structure of the skin that is made up of a hair follicle, a sebaceous gland, and the pore that opens to the skin called the follicular ostium (2). The sebaceous gland produces an oily waxy substance called sebum made up of lipids and sloughed glandular cells. Pilosebaceous units are found in

greatest number on the face, neck, back, and chest (2). Not surprisingly, this is where you will find most acne!

So what happens in the pilosebaceous unit to cause the acne we see in the mirror? Four main processes occur in the pilosebaceous unit that contribute to acne. We will go through each individually. These steps are helpful to know when we talk about treatment of acne. The four processes are (2):

1. **Abnormal keratinization:** each hair follicle is lined with skin cells in the upper portion, closer to the skin surface. Normally, these skin cells are sloughed off into the lumen and pushed out through the follicular opening onto the skin surface. In acne, overproduction of these skin cells occurs and they also become more sticky, or cohesive. When these cells build up and stick to one another and to the epithelial lining, a process known as **retention keratosis** occurs and results in the formation of a **microcomedone** which plugs the pore (3). These plugs prevent sebum from draining out of the follicle through the ostium. When sebum accumulates below the plug of skin cells, clinically we see what is known as a comedone.
2. **Hormonal stimulation of sebum production:** sebum is produced by sebaceous glands, which are part of the pilosebaceous unit. The amount of sebum produced is regulated by adrenal androgens. At the onset of puberty, increased production of DHEAS, dihydrotestosterone and testosterone stimulate sebum production, resulting in larger, more active sebaceous glands.
3. **Inflammation:** Once the keratin plug forms and sebum builds up, there reaches a point where the follicle wall ruptures and the contents spill into the surrounding dermis. This leads to an inflammatory response where neutrophils come to attack the foreign mixture of sebum and keratin. This inflammation causes the lesion starts to evolve from papules, to pustules, nodules and cysts.
4. **Bacteria:** Deep within the hair follicle, we normally have commensal, anaerobic, gram positive rods called *Propionibacterium acnes*. These bacteria are harmless, but play a role in aggravating acne inflammation once the disease process starts. *P. Acnes* produces lipases which break down sebum lipids into free fatty acids, which are highly comedogenic (3). In this way acne is an inflammatory process that is made worse by bacteria but not in itself an infectious process.

The combination of these four factors leads to non-inflammatory or inflammatory acne, depending on the extent of neutrophil and bacterial involvement.

As a general rule, comedonal acne is non-inflammatory, while papules, pustules, nodules, and cysts are inflammatory acne lesions.

In addition to this process, genetics and environmental factors can also play a role in causing or worsening acne. Stress, premenstrual hormone fluctuations, oil-based

cosmetics, and some medications can worsen acne, such as corticosteroids (2). Skin occlusion from helmets, toques, chin straps, and other sports equipment can also contribute to formation of acne lesions. One controversial topic is the role of dietary influences on acne. Current literature does not support food restrictions meant to mitigate acne flare-ups, unless the patient feels eating a certain food consistently causes or worsens their acne (2).

Clinical Presentation

Now, let's talk about acne and how it presents in neonates, infants, children and adolescents. Let's start with neonates and introduce our first case.

Joshua is a 3 week old male brought to your pediatric clinic by his mom for a rash on his cheeks. Upon gathering further history, mom tells you that the rash started on his cheeks about 1 week ago. She has been using moisturizer on the rash thinking it was eczema, but it has not helped. She is worried that it is infected because of all the little bumps. She denies any recent infectious symptoms or contacts. On exam, you note numerous erythematous papules and pustules to the cheeks bilaterally, and a few papules scattered on his chest. The rest of the exam is unremarkable.

Neonatal acne can present between birth to 6 weeks of age. What we commonly describe as neonatal acne is actually a condition called neonatal cephalic pustulosis (NCP). This condition affects approximately 20% of newborns (4). Lesions generally present at 2-3 weeks of life and resolve by 2-3 months of age. It presents as a mixture of papules and pustules on the face (cheeks tend to have the greatest number of lesions), neck, upper chest, and scalp. It is distinguished from infantile acne by its earlier onset and the absence of comedones (4). It is currently thought to be an inflammatory reaction to *Malassezia furfur* or other yeast on the skin (1). It's important to note that there are other neonatal pustular eruptions to consider in the differential, however for the purpose of this podcast we will focus on NCP. Here are two more examples [show next slide]. Most cases are self-resolving and usually require no treatment, however, some physicians may opt to treat with a topical antifungal like ketoconazole for severe cases.

Back to the case. You diagnose Joshua with neonatal acne and reassure his mother that this is a self-limiting process that does not need treatment in most cases. Joshua's lesions resolve within a month. Everything was going well until 3 months later, you see his name on your schedule again. When you see Joshua today, mom tells you the rash that he had when he was younger is back. Mom says the rash started as a few red bumps and now involves his cheeks, nose, and forehead. When you examine Joshua, he has numerous comedones, papules, and pustules on his cheeks bilaterally and some scattered papules and comedonal lesions on his nose and forehead. There are no signs of hyperandrogenism or endocrine disease such as breast development, pubic hair, increased muscle mass, or testicular growth.

Infantile acne affects babies 6 weeks to 1 year of age. It most commonly presents between 3 and 6 months of age and can persist for 6-12 months, sometimes lasting several years after time of onset (2). It presents with comedones, papules, pustules, and sometimes nodules. It is generally caused by increased production of adrenal and gonadal androgens and is more common in boys (2). Most cases are self-resolving (1). However, in this age group it is also important to examine the child for any signs of endocrine disorders involving sex hormones. It is important to assess their growth and signs of sexual precocity or virilization. If signs such as clitoromegaly, increased muscle mass, testicular growth, gynecomastia, pubic hair, or hirsutism are present in addition to acne, a referral to endocrinology is recommended (1).

Back to the case. You explain to mom that this time, the acne lesions are due to hormonal changes at this age. You are confident that this is infantile acne, and not neonatal acne because Joshua is now older and you can see comedones. You reassure her that the acne will go away with time, and that he is otherwise very healthy. You recommend a mild, pH neutral face wash for now.

You don't hear from Joshua and his mom for a while. Several years later, you see Joshua's name on your schedule again. The receptionist had booked him in yet again for a "rash". This time when you see Joshua and his mom, the rash looks quite different. Mom asks you if this is acne again, but you tell her that acne in this age group is quite rare. This time, the lesions are in the child's groin, armpits, behind the knees, and on his neck. He doesn't have any lesions on his face. You take a closer look at the individual lesions and note that they are flesh colored to pink papules with an umbilicated centre. They appear to have a shiny, waxy surface. Some of the lesions are in a linear pattern, as if they had spread from scratching. You diagnose Joshua with molluscum contagiosum, a common viral infection in kids. You advise mom that no treatment is necessary, as the infection will clear on its own with time, but reinforce the importance of hand hygiene and avoiding any scratching as this can spread the virus.

It is rare for acne to present for the first time in mid-childhood (between age 1 and 7). In this age group, the hormonal axis is suppressed, and adrenal androgen production is low. True acne in mid-childhood presents as a combination of comedones and inflammatory lesions, usually on the face (1). A workup for causes of hyperandrogenism should be performed to assess for endocrine disorders such as gonadal or adrenal tumors, Cushing's syndrome, congenital adrenal hyperplasia, and precocious puberty along with a referral to endocrinology (2).

Joshua's molluscum lesions go away eventually and you don't hear from him or his mom for a while. One day, you see Joshua marching down your clinic hallway. You check your schedule and realize his 9 year old sister, Marissa, is booked in to see you. When you go to see Marissa, mom tells you she has had a rash on her face for a few months now and thinks it is acne. Mom also noted that Marissa seems to be more moody lately. When you examine Marissa, you note numerous comedones to her chin, nose, and forehead. You agree that it is acne and inform mom that Marissa is likely starting puberty.

As children approach their teenage years, acne may be one of the first signs of pubertal maturation (1). Preadolescent acne presents in children between the age of 7 and 12. It is more common for girls to develop acne in this age category. Acne may appear before pubic hair growth, areolar budding in girls, and testicular enlargement in boys (2). It typically presents in the T-zone (forehead, chin, nose) and consists of open and closed comedones. Inflammatory lesions are uncommon. Again, if the acne is particularly severe or associated with other signs of excess androgens, it is important to consider endocrine disorders as part of the differential, including PCOS in girls.

You educate Marissa to start using benzoyl peroxide 2.5% applied to her face at bedtime after washing her face, as her acne is fairly mild. You also advise her to use a mild soap to wash her face twice a day, like Dove or Aveeno. She tries this for a few months and tells you it works well for her.

Years go by, and Joshua returns to your clinic with another rash. You check his chart and he is now 14 years old! How the time flies. When you go in to see him, he tells you he has developed a rash on his face and upper body over the past few months. He has tried washing his face more often and showering with a new shower gel. Nothing seems to be helping. He just started playing hockey again for the season and he finds the rash has become worse since then. He is the goal tender, so he wears a lot of protective padding. He is really distressed about his skin, and said his hockey friends are starting to make fun of him all the time. He is also finding the lesions to be painful now, and sometimes can't sleep because his skin hurts. On exam, you see numerous papules, pustules, nodules, and cysts involving most of his face (especially his forehead and chin) upper back, and chest. He also has some scarring from older lesions on his face and back.

Adolescent acne affects teenagers between the ages of 12 and 19. In adolescents, acne can present with one of three presentations: comedonal acne, papulopustular acne, or nodulocystic acne. We will go through what these lesions are and look like.

Comedonal acne is considered a non-inflammatory variation of adolescent acne. It consists of open comedones (blackheads) and/or closed comedones (whiteheads). These lesions generally present on the face (usually the T-zone) and sometimes on the back and chest. (2)

Papulopustular acne is considered an inflammatory variation. As the name implies, this type of acne presents with erythematous papules and pustules (pus-filled papules on an erythematous base). The individual lesions can vary in size, usually between 1-5 mm in diameter. If these lesions progress to become inflamed, indurated, and painful, it can progress to the next type of acne described, what is called nodulocystic acne (2).

Nodulocystic acne is characterized by nodules (solid elevation, <1 cm in diameter, deeper than it is wide) and pus-filled cysts (nodules that contain fluid or semisolid material). This form of acne can be very painful, scarring, and distressing (2).

Classification

Now that we have talked about the types of lesions, we can classify acne into three different categories of severity: mild, moderate, and severe. You may see different classifications in the literature, but I have chosen to describe one from *Pediatrics in Review* (2).

Mild acne

- Comedonal acne with few scattered papules
- Involves mainly the face, particularly the T-zone

Moderate acne

- Many papules and pustules
- +/- comedones
- 1-2 nodules
- Involves the face, chest and/or back
- May cause some small, shallow scars

Severe acne

- Many papules, pustules, nodules
- +/- comedones
- Cysts and/or sinus tracts
- Involves the face, chest and/or back
- Painful, may cause bleeding or visible drainage
- Can cause extensive scarring

In addition to these presentations of *Acne vulgaris*, there are two other more severe presentations of acne worth mentioning:

Acne conglobata is a severe form of nodulocystic acne in which sinus tracts and abscesses form (2).

Acne fulminans is a rare and serious type of acne that presents with sudden onset of nodular and suppurative acne accompanied by systemic symptoms of fever, arthralgias, osteolytic bone lesions, myalgias, liver and spleen enlargement, and significant fatigue. It requires emergent assessment and management by a dermatologist. It is most common in boys between the ages of 13 and 16 (2). Specific management of *Acne conglobata* and *Acne fulminans* is beyond the scope of this podcast.

We will discuss the rest of Joshua's case, including what we chose for treatment, in our next Podcast!

Other Considerations

Acne can be very distressing for children and teens. It is important to reassure your patients that acne is caused by a variety of factors, many of which are things we can't control, that it is not their fault, and that it can be managed with a variety of different medications.

Acne can impact a child or teen's mental health and self-esteem as they may feel embarrassed, ashamed, judged, and self-conscious. They may develop depression, social impairment, and in some cases suicidal ideation (1). Treating a patient's acne can improve their self-confidence, social functioning, and psychological health. Prompt treatment can not only decrease the amount of time they have active acne lesions, but also can decrease scarring and long-term disfigurement, especially in cases of moderate to severe acne.

It is important to ask your patient how they feel about their acne, and how much it bothers them. Studies have shown that the level of distress caused by acne may not correlate with the clinical severity of a patient's acne (1). It can have as much of an impact on a patient's social, psychological, and emotional symptoms as other chronic diseases such as diabetes or epilepsy (1). The impact it has on your patients is therefore individual to each patient, so don't make any assumptions and be sure to ask!

A clinic visit for acne can be a great opportunity to do a full HEADSSS history in your adolescent patients to identify any other issues such as bullying, drug use (particularly exogenous anabolic steroids), and mental health issues related to their skin condition or other factors.

Conclusion

1. Acne can occur in any pediatric age group, but is most common in preadolescent children and adolescents. It can be the first sign of puberty. Acne forms because of increased cohesiveness of keratinocytes sloughed off in the hair follicles and an excess production of sebum due to hormonal stimulation. Inflammation in the hair follicle occurs when sebum accumulates and ruptures the hair follicle wall, and the inflammatory reaction is exacerbated by bacteria.
2. There are four age categories that acne may present in: neonates, infants, children, adolescents. In most cases, it is due to normal physiologic changes in hormone production, however if acne is diagnosed in mid-childhood it is important to investigate secondary causes for hormone production such as tumors or endocrine disorders.
3. Acne can be classified as mild, moderate, or severe depending on the predominant lesion. Comedones are predominant in mild acne, papules and pustules are predominant in moderate acne, and severe acne may have all lesion types but is complicated by nodules, cysts, and scarring. *Acne fulminans* is a systemic disease and requires emergent assessment by a dermatologist.
4. Acne may have a significant impact on a child or adolescent's self-esteem and

mental health. It is important to ask about how they feel about their acne, and to screen for low self-confidence, bullying, depression, and suicidal ideation when assessing a patient with acne. Remember that even mild acne can cause a significant amount of distress!

Well, that concludes Part 1 of our podcast series on acne! Please check out Part II to learn about treatment options for preadolescent and adolescent acne! We will come back to the case of Joshua, to review how to treat his acne.

References:

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