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毛周角化病的临床诊疗与研究进展

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摘　要

毛周角化病(KP)也被称作毛发苔藓，是较为常见的一类过度角化性皮肤病。它主要表现为毛囊口处的小丘疹且伴随程度不一的毛囊周围红斑，我们针对这类常见又常让人困扰的疾病，从发病机制、症状表现以及治疗手段等方面开展了最新的梳理总结，研究发现毛周角化病归属于毛囊角化性疾病谱系，其中单纯型毛周角化病最为多见，其他变异型与罕见亚型则有红色毛周角化病、面颈部毛囊性红斑黑变病以及萎缩性毛周角化病相关谱系，FLG基因与ABCA12基因发生遗传突变是引发该病的核心因素，毛周角化病或许和寻常型鱼鳞病联系紧密与特应性皮炎的关联则可能性偏低，毛周角化病需重点鉴别的病症有棘状苔藓病以及寻常性鱼鳞病等。日常皮肤护理手段有做好皮肤保湿、避免长时间泡澡或淋浴，最好选用性质温和的香皂或清洁产品，外用角质剥脱剂属于首选治疗方案，后续可搭配外用维A酸类药物，若患者经局部治疗后效果不佳，还可以选择各类激光治疗与微晶磨皮术。

关键词

毛周角化病，毛发苔藓，发病机制，临床诊疗，治疗进展

Clinical Diagnosis, Treatment and Research Progress of Keratosis Pilaris

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Abstract

Keratosis pilaris (KP), also known as lichen pilaris, is a relatively common type of hyperkeratotic

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skin disease. It is mainly characterized by small papules at the hair follicle orifices accompanied by varying degrees of perifollicular erythema. We have conducted the latest review and summary on this common and often troublesome disease in terms of pathogenesis, clinical manifestations, and treatment methods. The study found that keratosis pilaris belongs to the spectrum of follicular keratotic diseases, among which the simple type of keratosis pilaris is the most common. Other variants and rare subtypes include erythromelanosis follicularis faciei, atrophicans-related spectrum, and keratosis pilaris rubra. Genetic mutations in the FLG gene and the ABCA12 gene are the core factors causing this disease. Keratosis pilaris may be closely related to ichthyosis vulgaris, but its association with atopic dermatitis is less likely. The diseases that need to be mainly differentiated from keratosis pilaris include lichen spinulosus, pituitary tumor disease, and ichthyosis vulgaris. Daily skin care measures, such as maintaining skin moisture, avoiding long baths or showers, and preferably using mild soaps or cleaning products, are important. Topical keratolytics are the first-line treatment, which can be followed by topical retinoids. If the patient's response to local treatment is poor, various laser treatments and microdermabrasion can also be considered.

Keywords

Keratosis Pilaris, Lichen Pilari, Pathogenesis, Clinical Diagnosis and Treatment, Treatment Progress

1. 引言

毛周角化病(KP)系一类良性角化性皮肤疾病，其核心特征表现为多发性毛囊性角化过度，皮损丘疹主要分布于上肢伸侧、大腿及臀部，本病诊断主要依据临床表现，对于典型毛周角化病，根据临床表现即可明确，一般无需进行皮肤活检或实验室检查，虽多数患者无需特殊干预治疗，但可酌情推荐外用药物，如水杨酸、乳酸和维 A 酸[1]。本文就毛周角化病(KP)的发病机制、临床表现及治疗方案进行阐述。

2. 流行病学

毛周角化病(KP)为全球范围内高发的皮肤疾病，其在普通人群中的患病率约为 40% [1] [2]。该病多在儿童阶段起病，病情于青春期时表现得最为显著，临床数据显示，51%的患者于 1 岁内起病，35%于 2 岁内起病，12%于 3 岁内出现症状，仅 2%的患者发病年龄超过 40 岁，女性群体的患病风险相对更高，青春期女性的受累比例可高达 80% [3]，现有研究未发现该病的发病情况存在种族或民族间的显著差异[4]。

3. 发病机制

迄今尚未明确其确切致病基因，目前研究聚焦的潜在致病机制包括前聚丝蛋白基因(FLG)、Ras 信号级联反应及 ABCA12 基因突变[5] [6]。临床统计显示 39%至 67%的患者存在明确的家族遗传病史[7]，泛发性毛周角化病(KP)的发病则罕见地与染色体 18p 缺失存在关联[8]。目前学界已针对毛周角化病(KP)的发病机制提出多种理论假说，该病核心诱因在于角蛋白的过度生成，生成的角蛋白会包裹住每一个毛囊结构，毛发被阻滞于角蛋白碎屑之下，难以穿透至皮肤表层，进而在皮肤表面形成孤立的毛囊性丘疹[4] [9]，丘疹下方常可观察到细小且呈卷曲状态的毛发[4]，激素水平波动亦可能参与 KP 的病情发展进程，

该病在高雄激素血症患者群体中发病率显著偏高[10] [11]。

3.1. FLG 基因发生功能缺失型突变

编码前聚丝蛋白的 FLG 基因发生功能缺失型突变，经统计学验证与 KP 存在显著关联性($P < 0.0001$) [12] [13]。聚丝蛋白作为表皮核心结构蛋白，可介导角蛋白丝聚集形成角化细胞，聚丝蛋白经水解可生成具备渗透调节活性的氨基酸，这些氨基酸能为皮肤表层供给水分，同时发挥光保护与酸化调节功能[14] [15]。FLG 基因突变会加剧角质形成细胞的异常角化进程，减少角质层含水量并促使皮肤 pH 值向碱性偏移，此类突变会引发皮肤干燥、上皮屏障功能受损、微生物定植增多及炎症反应等一系列病理改变[16] [17]。除上述因素外，皮脂腺结构与功能异常、雄激素水平升高、肥胖状态以及胰岛素或胰岛素样生长因子-1 (IGF-1)浓度下降等，均被证实与 KP 发病存在关联[9] [18] [19]。

3.2. ABCA12 基因发生错义失活型突变

ABCA12 基因发生错义失活型突变，同样被推测为 KP 的潜在致病因素，近期相关研究证实，ABCA12 基因突变仅存在于 KP 患病家系成员体内，在同家系未患病个体及健康对照人群中均未检出，芬兰开展的一项流行病学调查深入探讨了 FLG 与 ABCA12 基因的遗传突变在 KP 病因学中的作用机制[20]。芬兰 KP 患者群体中，病情严重程度的关键影响因素涵盖发病年龄较早、男性性别、吸烟行为、肥胖状态、合并哮喘病症及血清 IgE 水平升高等[20]。ABCA12 基因可编码一种 ATP 结合盒转运蛋白(ABC)，该蛋白主要介导板层颗粒与颗粒层角质形成细胞之间的脂质转运过程，尽管 ABCA12 蛋白的具体分子功能尚未完全阐明，但学界推测其突变会干扰脂质转运与角质层脱屑进程，进而诱发 KP 特征性的干燥、粗糙及坚硬性皮损[21]。临床应用中，治疗髓系白血病的尼洛替尼与治疗晚期黑色素瘤的维莫非尼，均有报道在少数用药患者中诱发类似 KP 的皮疹表现[22]-[27]。

4. 临床表现

毛周角化病(KP)初期皮损以大量簇集或散在分布的粗糙毛囊性角化丘疹为核心表现，此类丘疹多呈淡粉或肤色，顶端尖锐直径约 1 至 2 毫米，内部常包裹纤细且易折断的卷曲毳毛[28] [29]。其好发部位依次为上臂后外侧(92%)大腿(59%)及臀部(30%) [4]。面部、颈部、躯干及四肢远端部位亦可受累，但受累程度相对轻微[29]。KP 一般无明显自觉症状部分，患者可伴随瘙痒感，约半数患者的 KP 症状在冬季易出现加重趋势，夏季则可逐渐缓解，该现象可能与皮肤干燥及衣物摩擦等因素相关[3]。

4.1. 典型表现

该类丘疹会使皮肤呈现斑驳样外观与鸡皮样改变，患者常主诉皮肤触感粗糙如砂纸，部分病例可伴随红斑表现，但红斑程度多较轻微且仅局限于毛囊周边区域，皮肤镜下可见单毛囊口处多根毳毛、穿出角蛋白栓内的卷曲毛发、毛周角质管型以及伴或不伴色素沉着的毛囊周围红斑[30]。

4.2. 特殊类型

4.2.1. 红色毛周角化病

毛囊周围红斑显著时，临床采用“红色毛周角化病”命名[3] [31]，该变异型发生率呈年龄相关性递增，多见于 20~40 岁人群，女性发病率为男性的 2 倍[30]。

4.2.2. 白色毛周角化病

若丘疹呈灰白色且无红斑伴随，临床定义为白色毛发角化病[31]，此变异型高发于 1 岁以下婴幼儿，发生率随年龄增长逐步递减，男女发病无性别差异[30]。

4.2.3. 面部萎缩性毛周角化病

眉部瘢痕性红斑(又称面部萎缩性毛发角化病)为罕见变异型，核心特征为眉毛及颊部出现细小毛囊中心性、顶端尖锐的红色丘疹[32]，受累区域可出现毛发渐进性脱落表现[33]。

4.2.4. 面颈部毛囊性红斑黑变病(effC)

面颈部毛囊性红斑黑变病(effC)为毛周角化病的变异亚型，特征性表现为细小毛囊性丘疹，伴毛囊周围红斑及色素沉着[30]，病变常累及颊部、前额及颈部，多呈双侧分布[34]。effC 多在晚年起病，男性发病率显著高于女性[35] [36]。

4.3. 其他相关疾病

4.3.1. 寻常型鱼鳞病

毛周角化病(KP)在寻常型鱼鳞病患者中发病率显著升高，现有数据显示，75%的寻常型鱼鳞病患者合并存在毛周角化病，健康对照人群中该疾病的罹患率仅为 42% [1] [37]。儿童亚群中，100%的寻常型鱼鳞病患儿均伴随毛周角化病，而非寻常型鱼鳞病患儿的该疾病发生率仅为 30% [38]。

4.3.2. 特应性皮炎(AD)

既往研究曾认为毛周角化病(KP)与特应性皮炎(AD)存在关联，新近多项研究逐步证实二者之间并无明确相关性，芬兰一项新近研究对 502 例特应性皮炎(AD)患者展开分析，结果显示其毛周角化病(KP)罹患率偏低，且 KP 的疾病严重程度与特应性致敏状态无显著关联[13] [39]。另有研究数据显示，42.6%的特应性皮炎(AD)患者合并 KP，无特应性皮炎的对照人群中该比例为 41.7% ($p > 0.05$)，提示特应性皮炎的存在与否对 KP 的罹患率无统计学差异[1]。多项其他研究亦对 KP 与 AD 的关联性提出质疑，该领域仍需开展更深入的探索研究。

4.3.3. 其他疾病

毛周角化病还与肥胖症[40] [41]、1 型糖尿病[42]、心－面－皮肤综合征[32] [43]、唐氏综合征[44] [45]、IV 型胶原病[46]及努南综合征等多种系统性疾病存在共病关联[47]-[50]。

5. 鉴别诊断

KP 需与多种皮肤病进行鉴别诊断，其中包含小棘苔藓、毛囊性鱼鳞病、蟾皮病、毛棘状毛囊角栓病、发疹性毳毛囊肿、毛发红糠疹、毛囊角化病及 Kyrle 病。

5.1. 小棘苔藓

小棘苔藓在临床表现与组织病理特征上均与 KP 存在相似性，其核心特征为毛囊性角化性棘刺状丘疹聚集，形成色素减退性大斑片，KP 皮损在上臂与大腿部位分布更为广泛，小棘苔藓则多局限于肢体末端区域，分布范围相对局限，且不伴随红斑表现[51]。

5.2. 毛囊性鱼鳞病

毛囊性鱼鳞病临床以刺状毛囊性突起及毛囊周围红斑为主要表现，其发病与 FLG 基因功能缺失性突变密切相关，该病症临床更为罕见，部分病例可伴随身材矮小、智力发育障碍及脱发等表现[52]。病因学上还可能与 GJB2、MBTPS2 基因变异相关[53] [54]。

5.3. 蟾皮病

蟾皮病临床以毛囊角化过度为核心表现，部分病例可伴随毛囊周围红斑，发病多与营养缺乏相关，

其中以维生素 A 缺乏最为常见，诱因包括饮食摄入不足，或因医疗、外科手术引发的吸收障碍，皮损多为体积更大、分布范围更广的丘疹，部分丘疹可进一步发展形成斑块[55]。

5.4. 毛棘状毛囊角栓病与发疹性毳毛囊肿

毛棘状毛囊角栓病与发疹性毳毛囊肿二者均可出现全身广泛分布的角化过度性毛囊性丘疹，二者与 KP 存在显著的组织学差异。KP 以毛囊扩张且内部充满角蛋白为组织学特征，毛棘状毛囊角栓病可见表皮棘层肥厚，肥厚表皮包绕着同样扩张且富含角蛋白的毛囊，发疹性毳毛囊肿表皮结构正常，但可见上皮衬里囊肿，囊肿常与富含角蛋白的扩张、卷曲毛囊共同存在[56]。

5.5. 其他疾病

临床中 KP 还需与毛发红糠疹[57]、毛囊角化病[58]及 Kyrle 病[59] [60]等进行鉴别区分。

6. 临床诊疗进展

KP 多数病例无需特殊干预，随病程可逐步缓解[3]，部分患者皮损及症状可呈渐进性加重[30]。由于 KP 目前缺乏根治性治疗方案，临床治疗以缓解症状、改善皮肤外观及功能为核心目标，临床应建议患者采取规范化基础皮肤护理措施，包括外用保湿剂、角质溶解、剥脱剂、避免长时间热水洗浴，同时选用温和的清洁产品替代刺激性皂类[61]。

6.1. 外用药物

6.1.1. 一线外用药物

以乳酸、水杨酸或尿素为主要成分的外用角质溶解剂，是临床干预泛发性角化病的一线外用药物[62]。某临床系列研究纳入 30 例泛发性角化病受试者，经 2%水杨酸与 20%尿素复方乳膏连续干预 4~8 周后，其皮肤质地与外观均得到显著改善[31] [63]。另有 32 例患者每日 1 次应用含乳酸钠与尿素的外用制剂，持续干预 12 周后，皮肤粗糙状态及肤色均获得有效改善[64]。一项纳入 50 例患者的临床研究证实，分别给予 10%乳酸乳膏(每日 2 次，连续治疗 3 个月)或 5%水杨酸乳膏(相同给药方案)干预后，66%与 52%的受试者皮损范围均呈现不同程度的缩小，对于合并炎症反应的患者，可在上述角质剥脱剂治疗的基础上，联合中弱效外用糖皮质激素，每日 1~2 次外用，疗程设定为 7~10 天，1%西罗莫司乳膏也属于该类常用外用制剂，将其用于红斑型毛发角化病的治疗时，可呈现出较好的临床效果，现阶段相关临床证据仅在少数病例研究中有所报道[65] [66]。

6.1.2. 二线外用药物

外用维 A 酸类制剂以维 A 酸、他扎罗汀为核心代表，属于临床二线治疗药物，一项纳入 49 例受试者的回顾性临床研究表明，14 例受试者经外用维 A 酸类制剂干预后获得明确临床获益，该部分受试者中多数反馈外用维 A 酸乳膏可发挥确切疗效，一项随机、安慰剂对照、双盲前瞻性临床研究选取 33 例受试者，给予 0.05%他扎罗汀乳膏每日外用、连续干预 3 个月，研究结果证实受试者红斑、瘙痒及皮肤粗糙等症状均获显著缓解，一项纳入 20 例受试者的开放性临床研究显示，每日外用 0.01%他扎罗汀乳剂并持续干预 4~8 周，KP 皮损可在干预后 2 周内实现完全清除[67]。

6.2. 激光疗法

6.2.1. 调 Q1064 nm Nd:YAG 激光

激光疗法可作为外用药物干预效果欠佳的KP患者的备选治疗方案，临床推荐将调Q1064 nm Nd:YAG激光作为初始治疗手段，该疗法经临床验证具备最优的治疗效果，某临床研究纳入 12 例受试者，采用调

Q1064 nm Nd:YAG 激光持续干预 20 周，结果表明受试者皮肤质地及色素沉着异常均得到一定程度改善[68]。另有临床调研数据显示，10 例受试者接受每周 1 次的调 Q1064 nm Nd:YAG 激光干预，连续治疗 5 周后，其色素沉着异常相关症状均得到改善[69]。全部受试者均反馈本次治疗方案可有效改善 KP 症状，且对治疗效果整体满意[70]。还有一项临床研究对 23 例受试者进行疗效评估，最终证实受试者皮肤粗糙程度得到显著改善[71] [72]。

6.2.2. 二氧化碳点阵激光

二氧化碳点阵激光在 KP 的临床治疗中，已展现出良好的应用前景，某单盲随机对照临床试验纳入 20 例 KP 患者，接受为期 12 周的二氧化碳点阵激光治疗后，其平均改善评分呈现出显著升高($p = 0.05$)，经研究者整体评估，30%的皮损可达到中度及以上改善效果，角化性丘疹与色素沉着的改善程度均达 2 级及以上，二氧化碳点阵激光虽具备明确治疗效果，相较于调 Q1064 nm Nd:YAG 激光，其在角栓性皮损的改善层面存在一定劣势($p = 0.023$) [73]，且在深肤色人群中不良反应发生率有所升高，两种激光联合应用可获得最优的改善效果，提示二者联用可能产生累加治疗效应[74] [75]。

6.2.3. 激光联合微晶磨皮

其他临床治疗方案可采用脉冲染料激光与翠绿宝石激光联合微晶磨皮干预，某研究对 26 例受试者开展随访观察，受试者先接受 595 nm 脉冲染料激光治疗，间隔 2 周后予以长脉冲 755 nm 翠绿宝石激光干预，再间隔 1 周后实施微晶磨削术，整体干预周期为 3 个月[76]，多数受试者在红斑症状、皮肤质地及色素沉着异常方面均获得不同程度缓解，治疗相关不良反应包含术后一过性红斑，该类症状可在数日内自然缓解，以及术后脱屑表现，经润肤剂干预后 2 周内可逐渐恢复[77]，单独应用长脉冲 755 nm 翠绿宝石激光亦展现出作为备选治疗手段的应用前景。

7. 结论

毛周角化病(KP)治疗核心定位于症状缓解、皮肤外观改善及屏障功能修复，外用角质溶解剂(如乳酸、水杨酸制剂)为临床一线药物，维 A 酸类外用药物为二线药物，上述疗效不佳时可用调 Q1064 nm Nd:YAG 激光、二氧化碳点阵激光等物理治疗可作为补充手段。当前 KP 基础研究与临床转化衔接存在明显不足，重型及难治性病例治疗手段相对匮乏，角栓性皮损改善效果个体差异性较大，且缺乏统一标准化的疗效评估准则，无法为临床诊疗提供充分支撑。后续研究需紧扣临床诊疗需求与发病机制攻坚两大核心，一方面推进新型温和外用制剂研发，在强化角质剥脱、保湿修复效能基础上降低局部刺激反应，另一方面搭建个体化护理体系，结合患者发病年龄、病情严重程度、肤质特点及基因背景，制定精准护理与治疗联合干预方案，同时深化致病基因及下游分子通路探究，助力基因编辑技术、靶向药物等新型治疗手段的研发落地，填补靶向治疗领域空白，完善 KP 诊疗规范，探索激光疗法优化组合及疗效提升路径，推动 KP 诊疗模式由单纯症状控制向精准化、个体化转型，逐步开展根治性治疗的相关探索与临床实践。

参考文献

[1] Mevorah, B., Marazzi, A. and Frenk, E. (1985) The Prevalence of Accentuated Palmoplantar Markings and Keratosis Pilaris in Atopic Dermatitis, Autosomal Dominant Ichthyosis and Control Dermatological Patients. *British Journal of Dermatology*, **112**, 679-685. https://doi.org/10.1111/j.1365-2133.1985.tb02336.x

[2] Forman, L. (1954) Keratosis Pilaris. *Bulletin de la Société Française de Dermatologie et de Syphiligraphie*, **61**, 192-194.

[3] Poskitt, L. and Wilkinson, J.D. (1994) Natural History of Keratosis Pilaris. *British Journal of Dermatology*, **130**, 711-713. https://doi.org/10.1111/j.1365-2133.1994.tb03406.x

[4] Thomas, M. and Khopkar, U.S. (2012) Keratosis Pilaris Revisited: Is It More Than Just a Follicular Keratosis? *International Journal of Trichology*, **4**, 255-258.

[5] Ueda, A. (2014) Treatment of Lichen Pilaris with a Q-Switched Nd:Yag Laser in Quasi Long-Pulsed Mode: A Case Report (A Secondary Publication). *LASER THERAPY*, **23**, 211-220. https://doi.org/10.5978/islsm.14-cr-01

[6] Pennycook, K.B. and McCready, T.A. (2023) Keratosis Pilaris. StatPearls Publishing.

[7] Wang, J.F. and Orlow, S.J. (2018) Keratosis Pilaris and Its Subtypes: Associations, New Molecular and Pharmacologic Etiologies, and Therapeutic Options. *American Journal of Clinical Dermatology*, **19**, 733-757. https://doi.org/10.1007/s40257-018-0368-3

[8] Kootiratrakarn, T., Kampirapap, K. and Chunhasewee, C. (2015) Epidermal Permeability Barrier in the Treatment of Keratosis Pilaris. *Dermatology Research and Practice*, **2015**, 1-5. https://doi.org/10.1155/2015/205012

[9] Liakou, A.I., Esteves de Carvalho, A.V. and Nazarenko, L.P. (2014) Trias of Keratosis Pilaris, Ulerythema Ophryogenes and 18p Monosomy: Zouboulis Syndrome. *The Journal of Dermatology*, **41**, 371-376. https://doi.org/10.1111/1346-8138.12442

[10] Gruber, R., Sugarman, J.L., Crumrine, D., Hupe, M., Mauro, T.M., Mauldin, E.A., *et al*. (2015) Sebaceous Gland, Hair Shaft, and Epidermal Barrier Abnormalities in Keratosis Pilaris with and without Filaggrin Deficiency. *The American Journal of Pathology*, **185**, 1012-1021. https://doi.org/10.1016/j.ajpath.2014.12.012

[11] Oranje, A.P., Van Osch, L.D. and Oosterwijk, J.C. (1994) Keratosis Pilaris Atrophicans. One Heterogeneous Disease or a Symptom in Different Clinical Entities? *Archives of Dermatological Research*, **130**, 500-502.

[12] Barth, J.H., Wojnarowska, F. and Dawber, R.P.R. (1988) Is Keratosis Pilaris Another Androgen-Dependent Dermatosis? *Clinical and Experimental Dermatology*, **13**, 240-241. https://doi.org/10.1111/j.1365-2230.1988.tb00688.x

[13] Brown, S.J., Relton, C.L., Liao, H., Zhao, Y., Sandilands, A., Wilson, I.J., *et al*. (2008) Filaggrin Null Mutations and Childhood Atopic Eczema: A Population-Based Case-Control Study. *Journal of Allergy and Clinical Immunology*, **121**, 940-946.e3. https://doi.org/10.1016/j.jaci.2008.01.013

[14] Salava, A., Salo, V. and Remitz, A. (2022) Keratosis Pilaris and Filaggrin Loss-of-Function Mutations in Patients with Atopic Dermatitis—Results of a Finnish Cross-Sectional Study. *The Journal of Dermatology*, **49**, 928-932. https://doi.org/10.1111/1346-8138.16477

[15] Barresi, C., Stremnitzer, C., Mlitz, V., Kezic, S., Kammeyer, A., Ghannadan, M., *et al*. (2011) Increased Sensitivity of Histidinemic Mice to UVB Radiation Suggests a Crucial Role of Endogenous Urocanic Acid in Photoprotection. *Journal of Investigative Dermatology*, **131**, 188-194. https://doi.org/10.1038/jid.2010.231

[16] Kezic, S., O'Regan, G.M., Yau, N., Sandilands, A., Chen, H., Campbell, L.E., *et al*. (2011) Levels of Filaggrin Degradation Products Are Influenced by Both Filaggrin Genotype and Atopic Dermatitis Severity. *Allergy*, **66**, 934-940. https://doi.org/10.1111/j.1398-9995.2010.02540.x

[17] Nakagawa, N., Sakai, S., Matsumoto, M., Yamada, K., Nagano, M., Yuki, T., *et al*. (2004) Relationship between NMF (Lactate and Potassium) Content and the Physical Properties of the Stratum Corneum in Healthy Subjects. *Journal of Investigative Dermatology*, **122**, 755-763. https://doi.org/10.1111/j.0022-202x.2004.22317.x

[18] Rawlings, A.V. and Harding, C.R. (2004) Moisturization and Skin Barrier Function. *Dermatologic Therapy*, **17**, 43-48. https://doi.org/10.1111/j.1396-0296.2004.04s1005.x

[19] Zouboulis, C.C., Schagen, S. and Alestas, T. (2008) The Sebocyte Culture: A Model to Study the Pathophysiology of the Sebaceous Gland in Sebostasis, Seborrhoea and Acne. *Archives of Dermatological Research*, **300**, 397-413. https://doi.org/10.1007/s00403-008-0879-5

[20] Barth, J.H., Ng, L.L., Wojnarowska, F. and Dawber, R.P. (1988) Acanthosis Nigricans, Insulin Resistance and Cutaneous Virilism. *British Journal of Dermatology*, **118**, 613-619.

[21] Salava, A., Salo, V., Leppänen, J., Lauerma, A. and Remitz, A. (2022) Factors Associated with Severity of Atopic Dermatitis—A Finnish Cross-Sectional Study. *Journal of the European Academy of Dermatology and Venereology*, **36**, 2130-2139. https://doi.org/10.1111/jdv.18378

[22] Liu, F., Yang, Y., Zheng, Y., Liang, Y. and Zeng, K. (2018) Mutation and Expression of aBCa12 in Keratosis Pilaris and Nevus Comedonicus. *Molecular Medicine Reports*, **18**, 3153-3158. https://doi.org/10.3892/mmr.2018.9342

[23] Jimenez-Cauhe, J., Fernandez-Gonzalez, P., Ortega-Quijano, D., Fernandez-Nieto, D. and Saceda-Corralo, D. (2021) Keratosis Pilaris-Like Eruption Induced by Nilotinib. *Italian Journal of Dermatology and Venereology*, **156**, 47-48. https://doi.org/10.23736/s2784-8671.19.06333-8

[24] Frioui, R., Rabhi, F., Gargouri, F., Jaber, K. and Dhaoui, A. (2021) Nilotinib-Induced Keratosis Pilaris Associated with Cicatricial Alopecia Resembling Frontal Fibrosing Alopecia. *Dermatologic Therapy*, **34**, e14579. https://doi.org/10.1111/dth.14579

[25] Oro-Ayude, M., Feito, M., Quintana-Castanedo, L., Beato-Merino, M.J. and De Lucas, R. (2020) Keratosis Pilaris-Like Eruption Secondary to Nilotinib in a Child. *Pediatric Dermatology*, **37**, 968-969. https://doi.org/10.1111/pde.14267

[26] Kowe, P.A., Wankhade, V.H., Malpani, S.S. and Singh, R.P. (2021) Nilotinib-Induced Generalized Keratosis Pilaris:

Report of a Rare Case. *Indian Journal of Pharmacology*, **53**, 330-331. https://doi.org/10.4103/ijp.ijp_553_20

[27] El Khoury, R., Tawil, M., Tomb, R. and Ghosn, M. (2017) Nilotinib-Induced Keratosis Pilaris Associated with Alopecia Areata and Eyebrow Thinning. *International Journal of Trichology*, **9**, 87-89. https://doi.org/10.4103/ijt.ijt_1_17

[28] Rinderknecht, J.D., Goldinger, S.M., Rozati, S., Kamarashev, J., Kerl, K., French, L.E., *et al*. (2013) Rasopathic Skin Eruptions during Vemurafenib Therapy. *PLOS ONE*, **8**, e58721. https://doi.org/10.1371/journal.pone.0058721

[29] Hwang, S. and Schwartz, R.A. (2008) Keratosis Pilaris: A Common Follicular Hyperkeratosis. *Cutis*, **82**, 177-180.

[30] Panchaprateep, R., Tanus, A. and Tosti, A. (2015) Clinical, Dermoscopic, and Histopathologic Features of Body Hair Disorders. *Journal of the American Academy of Dermatology*, **72**, 890-900. https://doi.org/10.1016/j.jaad.2015.01.024

[31] Marqueling, A.L., Gilliam, A.E., Prendiville, J., Zvulunov, A., Antaya, R.J., Sugarman, J., *et al*. (2006) Keratosis Pilaris Rubra: A Common but Underrecognized Condition. *Archives of Dermatological Research*, **142**, 1611-1616.

[32] Lateef, A. and Schwartz, R.A. (1999) Keratosis Pilaris. *Cutis*, **63**, 205-207.

[33] Morton, C.M., Bhate, C., Janniger, C.K. and Schwartz, R.A. (2014) Ulerythema Ophryogenes: Updates and Insights. *Cutis*, **93**, 83-87.

[34] Arnold, A.W. and Buechner, S.A. (2006) Keratosis Pilaris and Keratosis Pilaris Atrophicans Faciei. *Journal der Deutschen Dermatologischen Gesellschaft*, **4**, 319-323. https://doi.org/10.1111/j.1610-0387.2006.05933.x

[35] Borkovic, S.P., Schwartz, R.A. and McNutt, N.S. (1984) Unilateral Erythromelanosis Follicularis Faciei et Colli. *Cutis*, **33**, 163-170.

[36] Augustine, M. and Jayaseelan, E. (2008) Erythromelanosis Follicularis Faciei et Colli: Relationship with Keratosis Pilaris. *Indian Journal of Dermatology, Venereology and Leprology*, **74**, 47-49.

[37] Rather, S., Yaseen, A. and Mukhija, M. (2016) Erythromelanosis Follicularis Faciei et Colli—A Cross-Sectional, Descriptive Study. *Indian Journal of Dermatology*, **61**, 308-313. https://doi.org/10.4103/0019-5154.182419

[38] Castela, E., Chiaverini, C., Boralevi, F., Hugues, R. and Lacour, J.P. (2012) Papular, Profuse, and Precocious Keratosis Pilaris. *Pediatric Dermatology*, **29**, 285-288. https://doi.org/10.1111/j.1525-1470.2011.01616.x

[39] Brown, S.J., Relton, C.L., Liao, H., Zhao, Y., Sandilands, A., McLean, W.H.I., *et al*. (2009) Filaggrin Haploinsufficiency Is Highly Penetrant and Is Associated with Increased Severity of Eczema: Further Delineation of the Skin Phenotype in a Prospective Epidemiological Study of 792 School Children. *British Journal of Dermatology*, **161**, 884-889. https://doi.org/10.1111/j.1365-2133.2009.09339.x

[40] Williams, H.C., Jburney, P.G., Hay, R.J., Archer, C.B., Shipley, M.J., Ahunter, J.J., *et al*. (1994) The U.K. Working Party's Diagnostic Criteria for Atopic Dermatitis. *British Journal of Dermatology*, **131**, 383-396. https://doi.org/10.1111/j.1365-2133.1994.tb08530.x

[41] Boza, J.C., Trindade, E.N., Peruzzo, J., Sachett, L., Rech, L. and Cestari, T.F. (2012) Skin Manifestations of Obesity: A Comparative Study. *Journal of the European Academy of Dermatology and Venereology*, **26**, 1220-1223. https://doi.org/10.1111/j.1468-3083.2011.04265.x

[42] Güven, M., Anık, A., Ünüvar, T., İlgün Gürel, D. and Şendur, N. (2022) Cutaneous Manifestations of Obesity in Turkish Children: A Comparative Study. *Pediatric Dermatology*, **39**, 513-519. https://doi.org/10.1111/pde.14978

[43] Pavlović, M.D., Milenković, T., Dinić, M., Mišović, M., Daković, D., Todorović, S., *et al*. (2007) The Prevalence of Cutaneous Manifestations in Young Patients with Type 1 Diabetes. *Diabetes Care*, **30**, 1964-1967. https://doi.org/10.2337/dc07-0267

[44] Piérard, G.E., Soyeur-Broux, M., Estrada, J.A., Piérard-Franchimont, C., Soyeur, D. and Verloes, A. (1990) Cutaneous Presentation of the Cardio-Facio-Cutaneous Syndrome. *Journal of the American Academy of Dermatology*, **22**, 920-922. https://doi.org/10.1016/0190-9622(90)70126-3

[45] Bilgili, S.G., Akdeniz, N., Karadag, A.S., Akbayram, S., *et al*. (2011) Mucocutaneous Disorders in Children with Down Syndrome: Casecontrolled Study. *Journal of Genetic Counseling*, **22**, 385-392.

[46] Daneshpazhooh, M., Mohammad-Javad Nazemi, T., Bigdeloo, L. and Yoosefi, M. (2007) Mucocutaneous Findings in 100 Children with down Syndrome. *Pediatric Dermatology*, **24**, 317-320. https://doi.org/10.1111/j.1525-1470.2007.00412.x

[47] Ritter, A.M. and Wine Lee, L. (2022) Keratosis Pilaris in Collagen Type VI-Related Disorders. *Pediatric Dermatology*, **39**, 133-134. https://doi.org/10.1111/pde.14883

[48] Fernández-Canga, P., Vázquez-Osorio, I., Álvarez-Cuesta, C.C. and Rodríguez-Díaz, E. (2019) Noonan-Syndrom mit multiplen lentigines und ausgeprägter Keratosis pilaris. *Journal der Deutschen Dermatologischen Gesellschaft*, **17**, 748-751. https://doi.org/10.1111/ddg.13880_g

[49] Purnak, S., Topçu, V., Çavdarlı, B., Kadan, E. and Yalçın, B. (2018) Widespread Keratosis Pilaris in a Patient with Noonan Syndrome with Multiple Lentigines. *International Journal of Dermatology*, **57**, e140-e141.

https://doi.org/10.1111/ijd.14209

[50] Matriwong, P., Langkungamvong, N. and Asawanonda, P. (2019) Intense Pulsed-Light Therapy Significantly Improves Keratosis Pilaris: A Randomized, Double-Blind, Sham Irradiation-Controlled Trial. *The Journal of Clinical and Aesthetic Dermatology*, **12**, 53-57.

[51] Bessis, D., Miquel, J., Bourrat, E., Chiaverini, C., Morice-Picard, F., Abadie, C., *et al*. (2019) Dermatological Manifestations in Noonan Syndrome: A Prospective Multicentric Study of 129 Patients Positive for Mutation. *British Journal of Dermatology*, **180**, 1438-1448. https://doi.org/10.1111/bjd.17404

[52] Friedman, S.J. (1990) Lichen Spinulosus. Clinicopathologic Review of 35 Cases. *Journal of the American Academy of Dermatology*, **22**, 261-264. https://doi.org/10.1016/0190-9622(90)70035-g

[53] Alfadley, A., Al Hawsawi, K. and Al Aboud, K. (2003) Ichthyosis Follicularis: A Case Report and Review of the Literature. *Pediatric Dermatology*, **20**, 48-51. https://doi.org/10.1046/j.1525-1470.2003.03011.x

[54] Youssefian, L., Naji, M., Park, J.S., Rajabi, F., Abdollahimajd, F., Mahmoudi, H., *et al*. (2022) Ichthyosis Follicularis Syndromes in Patients with Mutations in GJB2. *Clinical and Experimental Dermatology*, **47**, 1561-1566. https://doi.org/10.1111/ced.15217

[55] Fong, K., Takeichi, T., Liu, L., Pramanik, R., Lee, J., Akiyama, M., *et al*. (2015) Ichthyosis Follicularis, Atrichia, and Photophobia Syndrome Associated with a New Mutation in MBTPS2. *Clinical and Experimental Dermatology*, **40**, 529-532. https://doi.org/10.1111/ced.12587

[56] Di Stefani, A., Orlandi, A., Chimenti, S. and Bianchi, L. (2007) Phrynoderma: A Cutaneous Sign of an Inadequate Diet. *Canadian Medical Association Journal*, **177**, 855-856. https://doi.org/10.1503/cmaj.070086

[57] Young, M.C., Jorizzo, J.L., Sanchez, R.L., Hebert, A.A., Thomas, D.R. and King, C.A. (1985) Trichostasis Spinulosa. *International Journal of Dermatology*, **24**, 575-580. https://doi.org/10.1111/j.1365-4362.1985.tb05854.x

[58] Wang, D., Chong, V.C., Chong, W. and Oon, H.H. (2018) A Review on Pityriasis Rubra Pilaris. *American Journal of Clinical Dermatology*, **19**, 377-390. https://doi.org/10.1007/s40257-017-0338-1

[59] Suryawanshi, H., Dhobley, A., Sharma, A. and Kumar, P. (2017) Darier Disease: A Rare Genodermatosis. *Journal of Oral and Maxillofacial Pathology*, **21**, 321-321. https://doi.org/10.4103/jomfp.jomfp_170_16

[60] Forouzandeh, M., Stratman, S. and Yosipovitch, G. (2020) The Treatment of Kyrle's Disease: A Systematic Review. *Journal of the European Academy of Dermatology and Venereology*, **34**, 1457-1463. https://doi.org/10.1111/jdv.16182

[61] Zegarska, B., Kallas, D., Schwartz, R.A., Czajkowski, R., *et al*. (2010) Graham-Little Syndrome. *Acta Dermatovenerol APA*, **19**, 39-42.

[62] Garwood, J.D. (1978) Keratosis Pilaris. *American Family Physician*, **17**, 151-152.

[63] Suástegui-Rodríguez, I., Camacho-Rosas, L.H., Peralta-Pedrero, M.L., Cruz, F.J. and Morales-Sánchez, M.A. (2022) Keratosis Pilaris Treatment: Evidence from Intervention Studies. *Skinmed*, **20**, 258-271.

[64] Novick, N.L. (1984) Practical Management of Widespread, Atypical Keratosis Pilaris. *Journal of the American Academy of Dermatology*, **11**, 305-306. https://doi.org/10.1016/s0190-9622(84)80522-8

[65] Weber, T.M., Kowcz, A. and Rizer, R. (2004) Evaluation of a Sodium Lactate and Urea Crème to Ameliorate Keratosis Pilaris. *Journal of the American Academy of Dermatology*, **50**, 47. https://doi.org/10.1016/j.jaad.2003.10.188

[66] Eckburg, A., Kazemi, T. and Maguiness, S. (2022) Keratosis Pilaris Rubra Successfully Treated with Topical Sirolimus: Report of a Case and Review of the Literature. *Pediatric Dermatology*, **39**, 429-431. https://doi.org/10.1111/pde.14963

[67] Bogle, M.A., Ali, A. and Bartel, H. (2004) Tazarotene 0.05% Cream for the Treatment of Keratosis Pilaris. *Journal of the American Academy of Dermatology*, **50**, 39. https://doi.org/10.1016/j.jaad.2003.10.158

[68] Gerbig, A.W. (2002) Treating Keratosis Pilaris. *Journal of the American Academy of Dermatology*, **47**, 457. https://doi.org/10.1067/mjd.2002.122733

[69] Park, J., Kim, B.J., Kim, M.N. and Lee, C.K. (2011) A Pilot Study of Q-Switched 1064-nm Nd: YAG Laser Treatment in the Keratosis Pilaris. *Annals of Dermatology*, **23**, Article 293. https://doi.org/10.5021/ad.2011.23.3.293

[70] Kim, S. (2011) Treatment of Pigmented Keratosis Pilaris in Asian Patients with a Novel Q-Switched Nd: YAG Laser. *Journal of Cosmetic and Laser Therapy*, **13**, 120-122. https://doi.org/10.3109/14764172.2011.581290

[71] Saelim, P., Pongprutthipan, M., Pootongkam, S., Jariyasethavong, V. and Asawanonda, P. (2013) Long-Pulsed 1064-nm Nd:YAG Laser Significantly Improves Keratosis Pilaris: A Randomized, Evaluator-Blind Study. *Journal of Dermatological Treatment*, **24**, 318-322. https://doi.org/10.3109/09546634.2012.660518

[72] Maitriwong, P., Tangkijngamvong, N. and Asawanonda, P. (2020) Innovative 1064-nm Nd:YAG Laser Significantly Improves Keratosis Pilaris, a Randomized, Double-Blind, Sham-Irradiation-Controlled Trial. *Lasers in Surgery and Medicine*, **52**, 509-514. https://doi.org/10.1002/lsm.23184

[73] Bayazit, S., Aşkın, Ö. and Kutlubay, Z. (2022) Comparative Study of the Efficacy of Fractional Er:YAG 2940 nm Laser

and Q-Switched Nd:YAG 1064 nm Laser in Keratosis Pilaris. *Journal of Cosmetic Dermatology*, **21**, 3809-3813. https://doi.org/10.1111/jocd.15193

[74] Vachiramon, V., Anusaksathien, P., Kanokrungsee, S. and Chanprapaph, K. (2016) Fractional Carbon Dioxide Laser for Keratosis Pilaris: A Single-Blind, Randomized, Comparative Study. *BioMed Research International*, **2016**, 1-6. https://doi.org/10.1155/2016/1928540

[75] Ismail, S. and Omar, S.S. (2020) Clinical and Dermoscopic Evaluation of Fractional Carbon Dioxide Laser in Management of Keratosis Pilaris in Egyptian Type Skin. *Journal of Cosmetic Dermatology*, **19**, 1110-1120. https://doi.org/10.1111/jocd.13140

[76] Lee, S.J., Choi, M.J., Zheng, Z., Chung, W.S., Kim, Y.K. and Cho, S.B. (2013) Combination of 595-nm Pulsed Dye Laser, Long-Pulsed 755-nm Alexandrite Laser, and Microdermabrasion Treatment for Keratosis Pilaris: Retrospective Analysis of 26 Korean Patients. *Journal of Cosmetic and Laser Therapy*, **15**, 150-154. https://doi.org/10.3109/14764172.2013.769276

[77] Li, M., Bai, Y., Duan, Z., Yuan, R., Liu, X., Liu, Y., *et al*. (2022) Efficacy and Safety of Long-Pulsed 755-nm Alexandrite Laser for Keratosis Pilaris: A Split-Body Randomized Clinical Trial. *Dermatology and Therapy*, **12**, 1897-1906. https://doi.org/10.1007/s13555-022-00771-5