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Original Article

Acne Vulgaris and its Association with Ocular Dryness - A Randomised Hospital Based Study

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Abstract

Background: *Dry eye is a multi factorial disease of the tears and ocular surface. Both acne vulgaris and mebomian glands are influenced by androgenic hormone and there is a strong correlation found between acne vulgaris and evaporative type of ocular dryness in the present study.*

Aim of the study: *To identify the prevalence of dryness in patients of acne vulgaris*

Study design: *A randomised hospital based study over a period of 3 years*

Methods & materials: *All patients between 13 -30 years of age with acne vulgaris both inflammatory and non inflammatory were screened randomly for dry eye using Schirmer's test, tear film breakup time (TBUT), tear film height, presence of conjunctival injection, punctate epithelial erosions (PEE) on flourescein stain. Meibomian gland dysfunction (MGD) was used to diagnose dry eye.*

Results: *Out of 200 patients male were [n=106] predominated and mostly in the age group of 21-25 years. After 3 months of treatment there was marked improvement in tear film break up time [TBUT] and Schirmer's test. Only 74 cases (37%) had punctate epitheleal lesions and 36% cases had associated mebomian gland dysfunction.*

Conclusions: *Both acne vulgaris and mebomian glands are influenced by androgenic hormone and there is strong correlation between acne vulgaris and ocular dryness.*

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Keywords: *Dryness & acne vulgaris, acne vulgaris & its eye manifestations, dry eyes, acne vulgaris.*

Introduction

Dry eye is a multifactorial disease of the tears and ocular surface. Ocular inflammation and changes in tear osmolarity are the two factors that underlie dry eye disease and do damage to the ocular surface.[1] The prevalence of dry eye ranges from 5% to 35% worldwide, while in India it is 29.25% based on Ocular Surface Disease Index (OSDI) data.[2] Abnormalities of the lipid layer caused by Meibomian gland dysfunction[MGD] [blepharitis] causes the tears evaporate too quickly.[3] Diagnosis is mostly based on the symptoms though a number of other tests may be used.[4]

Acne vulgaris is a common skin disease with prevalence reaching up to 80% during adolescence. It has a complex aetiology, involving abnormal keratinisation, hormonal function, bacterial growth, and immune hypersensitivity of pilosebaceous follicles of the head and upper trunk. The primary acne lesion is the "blackhead", an impaction and distension of the follicle with improperly desquamated keratinocytes and sebum.[5] At puberty, when androgens stimulate the production of sebum, pre-existing comedones become filled with lipid and may enlarge to become visible.[6] Inflammatory acne is the result of the host response to the follicular inhabitant Propionibacterium acnes.[7] P acnes also activate complement and are generally inflammatory when brought into contact with the immune system.[8] Non-ocular other disorders such as rosacea are often associated with MGD. This chronic inflammatory skin condition is found in areas with a dense distribution of sebaceous glands, and is more common during periods of increased sebum production.[9]

Meibomian glands are modified sebaceous gland that keep the ocular surface clean, healthy and well-lubricated.[10] Increase in gland activity accompanying puberty are attributed due to increase in androgen production.[11] Inflammation of the meibomian glands causes the glands to be obstructed by thick waxy secretions leading to tear film instability and increased evaporation.[12,13] The aetiology of meibomian gland dysfunction is unknown and may be due to any one of a variety of conditions, including bacterial infection[12], hormonal imbalance[14], autoimmune disease and inflammation.[15]

Material and Methods

200 consecutive patients between 13-30 years of age with acne vulgaris both inflammatory and non inflammatory complaining of either eye irritation, foreign body sensation, watering or redness attending outpatient department of our hospital were included in this study after taking written convent. In this cross-sectional study all patients were screened randomly for dry eyes. Schirmer's test, tear film breakup time (TBUT), tear film height, presence of conjunctival injection, punctate epithelial erosions (PEE), and meibomian gland dysfunction (MGD) were used to diagnose dry eye. Patient demographics including age, sex, smoking, occupation and working environment were also recorded. The presence of conjunctival injection, punctate epithelial erosions on cornea and Meibomian gland more details disease were looked for using fluorescein dye. McMonnies Dry Eye Questionnaire score of >10, Schirmer's test value of 10 mm in 5 minutes on Whatman's filter paper no. 41, TFBUT

value <10 seconds, presence of punctate epithelial erosions on cornea, conjunctival injection, papillary hypertrophy, follicles, and meibomian gland disease were considered as indicators of dry eye. A fluorescein strip was moistened with a saline solution and touched the inferior fornix. The patients were instructed to blink, and the pre-corneal tear film was examined under blue-light illumination. The time in seconds between the last blink and the appearance of a random dry spot was recorded by a stopwatch as the BUT and 10 s or less was considered abnormal.

The tear meniscus, which is formed between the lid surface and the bulbar conjunctiva, is present along the inferior lid margin. Of the TMH parameters studied, central TMH-R was measured at the 6 o'clock position. TMH-R values <0.1 mm were considered abnormal.

The Schirmer I test (without anesthesia) measures both basal and reflex tearing, and the Schirmer II test (with anesthesia) measures only the basal secretion of tearing with topical anesthesia. Schirmer with anesthesia test for basal secretion was applied with a filter strip located infero temporally without touching the cornea and is considered abnormal if wetting of the strip was 5 mm or less in 5 min. Inclusion criteria includes all patients with acne vulgaris both inflammatory & non-inflammatory between the age groups of 13-30 years attending the eye OPD with complaints of either eye irritation, FB sensation, watering and redness. Exclusion criteria were tear deficiency dry eye, corneal and conjunctival diseases, patients on isotretinion therapy, not on any anti-depressant, anti-allergic drugs, diabetes mellitus, Thyroid disorder, rheumatoid arthritis, any collagen vascular disease, allergic eye disease, corneal surgery, vitamin-A deficiency, prolonged computer work/ mobile use, pregnancy and smoking.

Results

200 consecutive patients of acne vulgaris both inflammatory and non inflammatory Involving male [Figure-1] and female patients [Figure-2] complaining of either eye irritation, foreign body sensation, watering or redness attending outpatient department of our hospital were included in this study after taking written convent. The study was done based on age and gender distribution. In this study majority of the patients were found between the age groups of 21–25 years, with males being predominated. Majority of them were presented with complaints of burning eyes and watering. [Table-1] On examination lustreless cornea was [Figure-3] found in 172 cases (86%), meibomian gland orifice capping was found in 73 cases (36.5%) along with meibomian gland dysfunction. [Table-2] Whereas 74 cases (37%) had punctuate keratitis [Table-3] on fluorescein staining. [Figure-4] Clinically 92 cases (46%) had associated mild conjunctival congestion. 148 patients had low tear film height (TFH) -1mm [74%] [Figure-5], 27 had 0.5mm [13.5%] and 25 patients had 2mm TFH [12.5%] on baseline examination. 175 cases (87.5%) had TBUT (tear film break-up time) less than 10 seconds. At presentation Schirmer test in majority of cases [175] had less than 15MM [87.5%] [mild dryness] but on subsequent follow up there were marked improvement in dry eyes [Schirmer test] [Figure-6] and tear film break up time (TBUT). [Table-4] eyes [Schirmer test] [Figure-6] and tear film break up time (TBUT). [Table-4] Almost every patient showed symptomatically better improvement of both ocular (dryness and MGD) and acne vulgaris after 15 days of treatment and acne vulgaris took about three months to be completely improved [Figure-7]. Cornea became clear and no dryness was present [Figure-8].

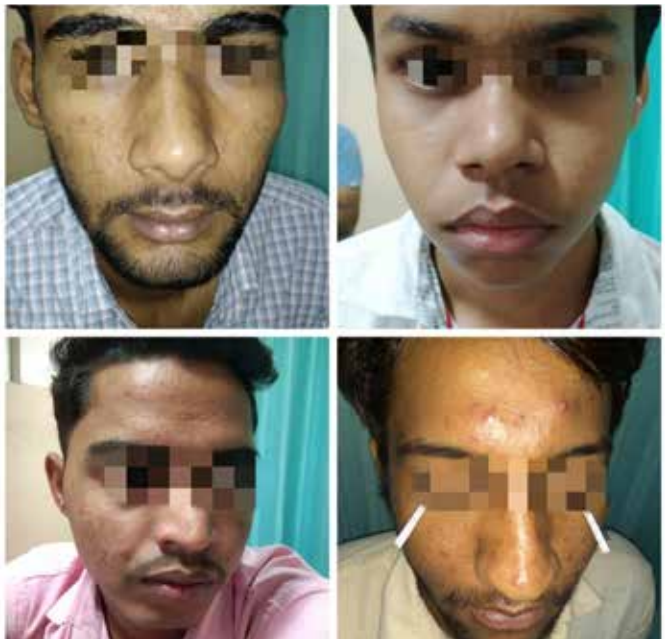

Figure 1: *Acne vulgaris of male patients*

Table 1: Various presenting complaints

COMPLAINTS	Frequency	Percent
BURNING EYE & WATERING	107	53.5
FORIGNBODY SENSATION	13	6.5
ITCHING & WATERING	17	8.5
WATERING	54	27
FREQUENT REDNESS	7	3.5
ON OFF BLURRING OF VISION	2	1
Total	200	100

Table 2: Corneal findings at presentation

CORNEAL findings	Frequency	Percent
CLEAR CORNEA	25	12.5
LUSTURELESS	172	86
FEW PUNCTATE LESIONS & LUSTURELESS cornea	3	1.5
Total	200	100

Table 3: Fluorescein staining results

fluorescein STAINING	Frequency	Percent
NEGATIVE	123	61.5
FEW PUNCTATE LESION	74	37
Grossly POSITIVE	3	1.5
Total	200	100

Table 4: Comparisons of symptoms, corneal status, TBUT, TFH, Schirmer's test and acne conditions on follow up

		15 DAYS	1M	3M
FOLLOW UP AFTER 15 DAYS	SYMP BETTER	200	200	200
TFH AFTER 15 DAYS	1 MM	175	175	170
	2 MM	25	25	30
LID MARGIN	Normal	200	200	200
CORNEA	LUSTURELESS	175	0	0
	CLEAR CORNEA	25	200	200
ACNE CONDITION	SAME	200	0	0
	IMPROVED	0	200	200
TBUT	**Baseline-10.34**	**10.35**	**12.62**	**12.91**
Schirmer's test	Baseline -11.67	11.88	19.46	26.78

Figure 2: *Acne vulgaris of female patients*

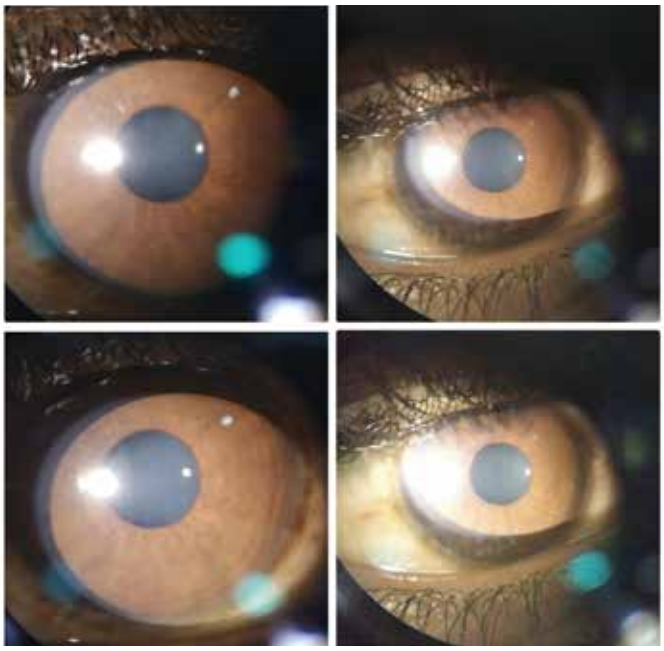

Figure 3: *Lustreless cornea*

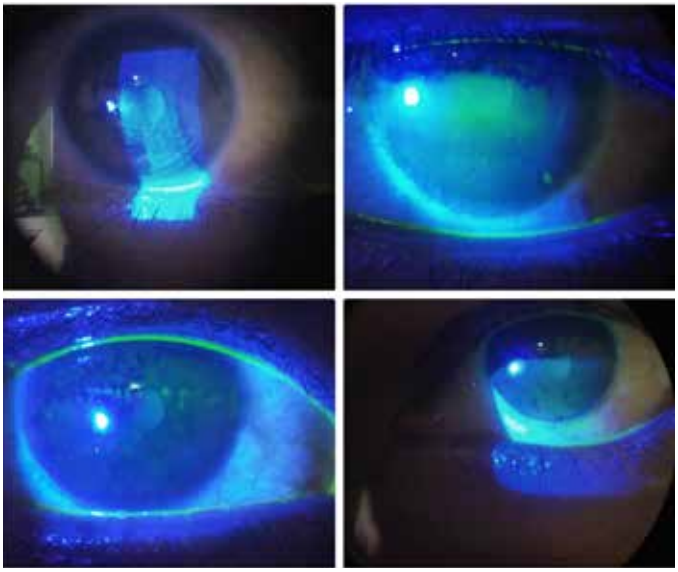

Figure 4: *Staining positive (punctate lesions)*

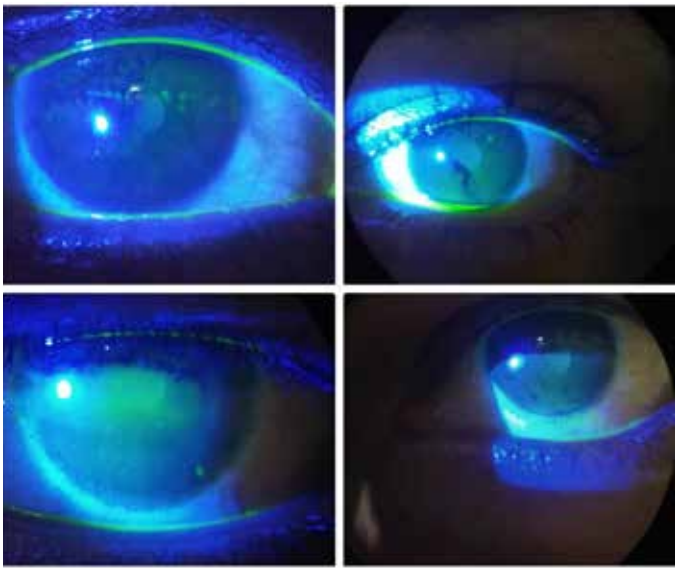

Figure 5: *Low tear film height*

Figure 6: *Schirmer test positive (dryness)*

Figure 7: *After treatment Acne improved*

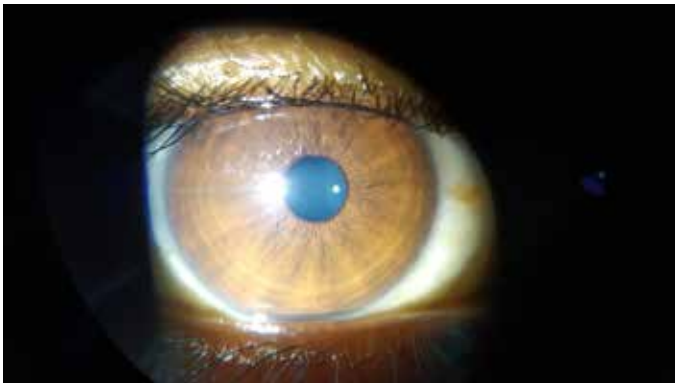

Figure 8: *Cornea clear, no dryness*

Discussion

Symptoms of Dry eye syndrome (DES), include irritation, redness, discharge, easily fatigued eyes and often blurring of vision.[16] Dry eye occurs when either the eye does not produce enough tears or when the tears evaporate too quickly. This can result from meibomian gland dysfunction, allergies, pregnancy, Sjogren's syndrome, vitamin A deficiency, LASIK surgery, and certain medications such as antihistamines, some blood pressure medication, hormone replacement therapy, and antidepressants. Chronic conjunctivitis such as from tobacco smoke exposure or infection may also lead to the condition.[17] Diagnosis is mostly based on the symptoms though a number of other tests may be used.[4,18] Blepharitis and Meibomian gland dysfunction are one of the most common causes of dry eyes.[1,3]

Meibomian glands are modified sebaceous gland that keeps the ocular surface clean, healthy and well-lubricated. It follows that hormonal effects on gland function are likely to be significant.[10,11,12] Sebaceous glands are relatively inactive until the teenage years, at which point they increase in size and secrete larger quantities of sebum. Both the increase in gland activity accompanying puberty and the decrease observed later in life are attributed to changes in androgen production. Inflammation of the meibomian glands (also known as meibomitis, meibomian gland dysfunction, or posterior blepharitis) causes the glands to be obstructed by thick waxy secretions leading to dry eyes. MGD causes dry eye due to abnormal meibum secretion, leading to tear film instability and increased evaporation. The aetiology of meibomian gland dysfunction is unknown and may be due to any one of a variety of conditions, including bacterial infection, hormonal imbalance, autoimmune disease and inflammation.[11,12]

Meibomian gland is an androgen target organ and that androgens influence the lipid profile within this tissue. This gland, through its production and secretion of lipids, promotes the stability and prevents the evaporation of the tear film.[19] Conversely, meibomian gland dysfunction, and the resultant lipid insufficiency, leads to a decreased stability and an increased evaporation of the tear film.[20] Androgens appear to act primarily on acinar epithelial cells in sebaceous glands, and these cells contain both androgen receptor mRNA and protein (in their nuclei). These acinar cells respond to androgens by producing proteins that augment both the synthesis and secretion of lipids. Interestingly, sebaceous gland activity and secretion decrease with age, and this aging-associated dysfunction has been correlated with both an atrophy of acinar cells and a reduction in serum androgen levels.[21]

Increased serum levels of testosterone and dehydroepiandrosterone sulphate in both genders should be considered as diagnostic markers for seborrheic meibomian gland dysfunction. Seborrheic MGD is characterized by hypersecretion of meibum.[22] Androgens (testosterone) are reported to control meibomian gland function, regulate the quality and/or quantity of lipids produced by this tissue, and promote the formation of the tear film's lipid layer.[20] Previous studies related to androgen deficiency revealed significant and striking alterations in the lipid patterns of meibomian gland secretions, and it was considered to be an important etiologic factor in the pathogenesis of evaporative dry eye.[20,21]

The effect of androgens on human skin is reported to increase sebaceous gland growth and differentiation, produce acne and seborrhea.[23,24] Adrenal glands secrete large amounts of DHEA and DHEA-S which are then converted into potent androgens (testosterone and dehydrotestosterone) or estrogens by stereogenic enzymes in the peripheral sites. Increased serum levels of DHEA-S have been reported in patients with seborrheic dermatitis, acne vulgaris, alopecia, and hirsutism.[23,24,25] Estrogens, glucocorticoids, and prolactin are also considered to influence sebaceous gland function by stimulating proliferation of sebocyte.[23,24,26]

Acne vulgaris affects ~80% of adolescents and young adults aged 11–30 years. The majority of affected individuals remit before the third decade of age, leaving the rest with an unpredictable course throughout their lives. The principal hallmarks of acne include follicular hyperproliferation and plugging, extensive formation of sebum, activity of Propionibacterium acnes, and inflammation.[27] Acne-prone individuals have larger sized sebaceous glands that are stimulated at the time of puberty. Dihydrotestosterone (DHT) was shown to be more selective to sebocytes of the face but not the leg. This determines the predilection of acne lesions to certain areas on the body.[28] In the meantime, while sebum generation is abundant, failure to shed intrafollicular keratinocytes results in obstruction of the pilosebaceous units with sebum and keratolytic debris resulting in larger comedones.[29] This, in turn, leads to plugging and studding of the follicular units with the pathogenic P. acnes leading to an exaggerated inflammatory response.[30] Hormones implicated in acne pathogenesis include androgens, estrogens, progesterone, insulin and insulin-like growth factor-1,

CRH, adrenocorticotropic hormone (ACTH), melanocortins, glucocorticoids, and growth hormone (GH).[31] Androgens represent the most important of all hormones regulating sebum production. As of puberty, androgens stimulate sebum production and acne formation in both sexes. This androgen-dependent secretion of sebum is mediated by potent androgens such as testosterone and DHT and likewise with weaker androgens. Progesterone inhibits 5α-reductase required to convert testosterone to the more potent DHT.[32]

Conclusion

Increased serum levels of testosterone and DHEA-S in both genders should be considered as diagnostic markers for seborrheic MGD and may affect severity of the disease.

References

1. The definition and classification of dry eye disease: report of the Definition and Classification Subcommittee of the International Dry Eye WorkShop (2007). *Ocul Surf* 2007;5:75-92.
2. Michael AL, Christophe B, Jules B, Murat D, Gary NF, Schigeru K, et al. The definition and classification of dry eye disease: Report of the definition and classification subcommittee of the international dry eye workshop (2007). *Ocul Surf* 2007; 5:75-92.
3. McCarty CA, Bansal AK, Livingston PM, Stanislavsky YL, Taylor HR. The epidemiology of dry eye in Melbourne, Australia. *Ophthalmology* 1998; 105:1114-9.
4. Smith RE. The tear film complex: Pathogenesis and emerging therapies for dry eyes. *Cornea* 2005; 24:1-7.
5. Kligman AM. An overview of acne. *J Invest Derm.* 1974; 62:268–287.
6. Goulden V, Stables GI, Cunliffe WJ. Prevalence of facial acne in adults. *J Am Acad Dermatol* 1999; 41:577-80.
7. Leyden JJ. The evolving role of Propionibacterium acnes in acne. *Semin Cutan Med Surg* 2001; 20:139–143.
8. Leyden JJ, McGinley KJ, Cavalieri S, Webster GF, Mills OH, Kligman AM. Propionibacterium acnes resistance to antibiotics in acne patients. *J Am Acad Derm* 1983; 8:41–45.
9. Vieira AC, Mannis MJ (December 2013). "Ocular rosacea: common and commonly missed". *J Am Acad Dermatol* 2013;6:69.
10. Knop E, Knop N, Brewitt H, et al. Meibomian glands: part III. Dysfuction- argument for a discrete disease entity and as an important cause of dry eye. *Ophthalmologe* 2009; 106(11):966–979.
11. Sullivian DA, Sullivian BD, Ullman MD, et al. Androgen influence on the meibomian gland. *Investigative Ophthalmology & Visual Science* 2000; 41:3732–3742.
12. Mathers WD, Shields WJ, Sachdev MS, Petroll WM, Jester JV. Meibomian gland dysfunction in chronic blepharitis. *Cornea* 1991; 10(4):277–285.
13. Driver PJ, Lemp MA. Meibomian gland dysfunction. *Surv Ophthalmol* 1996; 40:343–367.
14. Steagall RJ, Cermak JM, Wickham LA, Sullivan BD, Sullivan DA. Androgen control of gene expression in the rabbit meibomian gland [ARVO Abstract]. *Invest Ophthalmol Vis Sci.* 1999; 40(4):S537.
15. Sullivan DA, Bélanger A, Cermak JM, et al. Are women with Sjögren's syndrome androgen deficient? [ARVO Abstract]. *Invest Ophthalmol Vis Sci* 2000; 41(4):S276.
16. Michael AL, Christophe B, Jules B, Murat D, Gary NF, Schigeru K, et al. The definition and classification of dry eye disease: Report of the definition and classification subcommittee of the international dry eye workshop (2007). *Ocul Surf* 2007; 5:75-92.
17. Moss SE, Klein R, Klein BE. Prevalence of and risk factors for dry eye syndrome. *Arch Ophthalmol* 2000; 118:1264-8.
18. Versura P, Cellini M, Torreggiani A, Profazio V, Bernabini B, Caramazza R. Dryness symptoms, diagnostic protocol and therapeutic management: A report on 1,200 patients. *Ophthalmic Res* 2001; 33:221-7.
19. Sullivian DA, Sullivian BD, Ullman MD, et al. Androgen influence on the meibomian gland. *Investigative Ophthalmology & Visual Science* 2000; 41:3732–3742.
20. Sullivan DA, Sullivan BD, Evans JE, et al. Androgen deficiency, meibomian gland dysfunction, and evaporative dry eye. *Annals of the New York Academy of Sciences,* 2002; 966:211–222.
21. Krenzer KL, Dana MR, Ullman MD, et al. Effect of androgen deficiency on the human meibomian gland and ocular surface. *Journal of Clinical Endocrinology and Metabolism* 2000; 85(12):4874–4882.
22. Arita R, Itoh K, Maeda S, et al. Proposed diagnostic criteria for seborrheic meibomian gland dysfunction. *Cornea* 2010; 29(9):980–984.
23. Zouboulis CC, Chen WC, Thornton MJ, Qin K, Rosenfield R. Sexual hormones in human skin. *Hormone and Metabolic Research* 2007; 39(2):85–95.
24. Zouboulis CC. Acne and sebaceous gland function. *Clinics in Dermatology* 2004; 22(5):360–366.
25. Kim BJ, Kim JY, Eun HC, Kwon OS, Kim MN, Ro BI. Androgenic alopecia in adolescents: a report of 43 cases. *Journal of Dermatology* 2006; 33(10):696–699.
26. Mathers WD, Stovall D, Lane JA, Zimmerman MB, Johnson S. Menopause and tear function: the influence of prolactin and sex hormones on human tear production. *Cornea* 1998; 17(4):353–358.
27. Suh DH, Kwon HH. What's new in the physiopathology of acne. *Br J Dermatol* 2015; 172 (suppl 1):13–19.
28. Husein-ElAhmed H. Management of acne vulgaris with hormonal therapies in adult female patients. *Dermatol Ther* 2015; 28(3):166–172.
29. Deplewski D, Rosenfield RL. Role of hormones in pilosebaceous unit development. *Endocr Rev.* 2000; 21(4):363–392.
30. Beylot C, Auffret N, Poli F, et al. Propionibacterium acnes: an update on its role in the pathogenesis of acne. *J Eur Acad Dermatol Venereol* 2014;28(3):271–278.
31. Balachandrudu B, Niveditadevi V, Rani TP. Hormonal pathogenesis of acne – simplified. *Int J Sci Stu* 2015; 3:183–185.
32. Chen W, Thibout D, Zouboulis CC. Cutaneous androgen metabolism: basic research and clinical perspective. *J Invest Dermatol* 2002; 119:992–1007.

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