EFFECTS OF ORAL ISOTRETINOIN SUBSEQUENT TO DIAMOND DERMABRASION OF POST ACNE SCARING

Iftikhar Ahmed[1], Faisal Ahmed[2], Shiza Batool[3], Rubina Ghani[1], Hafeez ul Hassan[1]

ABSTRACT

Background: Acne vulgaris is treated by topical and or systemic antibiotics, vitamins and some keratolytics. Microdermabrasion, a modified technique, useful for scar removal is more natural, gentler and less invasive tool for doing exfoliation. **Objective:** To observe the comparative effects of diamond dermabrasion on post acne/inflammatory scaring with or with out oral Isotretinoin and its probable side effects. **Patients and Methods:** A total of 232 patients of post acne/inflammatory scaring were randomly enrolled. In this experimental study out of which 159 females were divided into two groups, F1 of 80 and F2 of 79 females. The F1 was prescribed on Isotretinoin 20 mg/day for 45 successive days after diamond dermabrasion performed by NOVA NV60. F2 received no further treatment after the procedure. The males were divided into M1 and M2, of 37 and 36 in each group respectively and were given isotretinoin 20mg/day in M1 group and no treatment in M2 group. **Results:** In female groups, 82.55% experienced non-inflammatory lesions, erythema in 80%, desquamation in 21.25%, mild to moderate inflammatory lesions in 17.5%, dryness in 88.75%, pruritus in 32.50% and stinging/burning in 13.75% was observed in Group F1. In group F2 these percentages were 74.68%, 77.2%, 17.72%, 25%, 79.74%, 43.03%, and 24.05% of the same parameters, respectively. F1were graded for progress, 02 females were of grade 0, 13 women obtained grade 1, 41 patients of Grade 2 and 24 females were of Grade 3. The progress grades for F2 were, Grade 0 had 11 females, Grade 1 had 27, Grade 2 had 38 while Grade 3 had only 03 females. In male group M1, 78.37% experienced non-inflammatory lesions, erythema in 83.78%, 29.72% had desquamation, 21% had mild to moderate inflammatory lesions, dryness in 89.18%, pruritus in 78.37% and stinging/burning in 16.20% in Group M1. In group M2 these percentages were 83.33%, 94.44%, 36.11, 25%, 83.33%, 77% and 27.77% of the same parameters, respectively. Progress grades for M1 were; Grade 0 for 04, Grade 1 for 10, Grade 2 for 16 and Grade 3 for 07. For M2 the same grading system was followed and Grade 0 had 02, Grade 1 for 19, Grade 2 were 11 and Grade 3 was 04. **Conclusion:** The suggestion of prescription of Isotretinoin following Diamond Dermabrasion is due to the powerful epithelial generation by the vitamin A analogue. This effect provides good and early healing of the abraded skin. However further studies are suggested with larger sample size.

Key words: Acne, diamond dermabrasion, isotretinoin.

INTRODUCTION

Acne vulgaris (or acne) is a common human skin disease, characterized by areas of skin with seborrhea, comedones, papules, pustules, nodules and possibly scarring.[1,2] Acne affects mostly skin with the densest population of sebaceous follicles; these areas include the face, the upper part of the chest, and the back. Severe acne is inflammatory, but acne can also manifest in non-inflammatory forms.[2,3,4] Acne occurs most commonly during adolescence, and often continues into adulthood. In adolescence, acne is usually caused by an increase in testosterone, which people of both genders accrue during puberty.[3,5,6]

Aside from scarring, its main effects are psychological, such as reduced self-esteem[7,8] and, according to one study, depression or suicide.[9] Acne usually appears during adolescence, when people already tend to be most socially insecure. Early and aggressive treatment is therefore advocated by some to lessen the overall impact to individuals.[8]

Acne develops as a result of blockage in follicles. The naturally occurring largely commensal bacterium propionibacterium acnes can cause inflammation, leading to inflammatory lesions in the dermis around the microcomedo or comedone, which results in redness and may result in scarring or hyperpigmentation.[10] Hormonal activity, such as menstrual cycles and puberty, may contribute to the formation of acne. The tendency to develop acne runs in families. A family history of acne is associated with an earlier occurrence of acne and an increased number of retentional acne lesions.[11] Scientific research indicates that increased acne severity is significantly associated with increased stress levels.[12,13] A high glycemic load diet and cow's milk have been associated with worsening acne.[14] Major issues during the course of the disease are psychological stress, recurrence and scars. The scars are the result of inflammation within the dermis brought on by acne.[14]

1.Baqai Medical University, Karachi, Pakistan
2.Ball Tree Surgery, Sompting, West Sussex, England
3. Aziz Fatima Medical and Dental College, Faisalabad, Pakistan

Correspondence: Prof. Dr. Iftikhar Ahmed, Chairman
Department of Biochemistry, Baqai Medical University, Karachi.

Tel: 92-21-3222047929 & 92-21-36702694
E.mail: dr_iftikharahmed@yahoo.com

The acne can be treated in various ways. Most commonly used medicines are the topical and or systemic antibiotics. But it is recommended that the systemic antibiotics may be reserved for more severe cases.[15] In females, the antiandrogen cyproterone in combination with an oestrogen is particularly effective at reducing androgenic hormone levels. A group of medications for normalizing the follicle cell life-cycle are topical retinoids such as tretinoin, adapalene and tazarotene. Isotretinoin has been shown to be very effective in treating severe acne and can either improve or clear well over 80% of patients. The drug has a much longer effect than anti-bacterial treatments and will often cure acne for good.[16] Some researchers are in favour to treat mild to modrate acne with only anti-inflammatory drugs, e.g. Naproxen or ibuprofen and nicotinamide.[17,18]

Some procedures may play a significant role to treat resistant or recurrent acne, such as; Dermabrasion.[19] It is a cosmetic medical procedure in which the surface of the skin is removed by abrasion (sanding). It is used to remove sun-damaged skin and to remove or lessen scars and dark spots on the skin.[20] Dermabrasion is useful for scar removal when the scar is raised above the surrounding skin, but is less effective with sunken scars. Another modified technique is Microdermabrasion.[21,22] It is a more natural skin care that is a gentler, less invasive technology for doing an exfoliation on the skin.

One of the most popular skin care treatments on the market is diamond microdermabrasion. Able to solve many different types of skin concerns, this procedure is easy, painless and extremely effective. Its mechanism of action is that the skin's surface is disrupted; cell division occurs which stimulates fibroblast activity leading to collagen production which leads to thicker, firmer skin.[1,23,24] Human skin sloughs off at a slower rate with age, so the exfoliation of several layers of the stratum corneum leaves skin fresh and radiant.

Diamond Tips can be natural but usually synthetic for lower costs. The erythema is partially due to circulation rather than only irritation. There is no risk of inhalation or particles remaining embedded in the skin. There is varied coarseness of diamond wands or tips. The diamond tips are able to fit some crystal microdermabrators. The diamond tips tend to dull from build-up of dead skin during treatment.[25,26] Diamond-based treatments on the other hand produce none of the hazardous dust that results from crystals.

Now a days due to increase awareness and knowledge towards the acne and related problems by the non medical individual, a rise has been observed for the use of vitamin A analogue and mechanics. Though, best results are achieved yet there is perplexity about the use of vitamin A derivatives after dermabrasion. There are two different opinions; not to prescribe or prescribe. Considering this confusion we designed a research that will evaluate the role of vitamin A derivative after the dermabrasion. Many scientists all over the globe are still searching for the same but no one tried to assess the use of Isotretinoin after Diamond Dermabrasion at least in Pakistan. This study was designed to; determine the effects of Diamond Dermabrasion on post acne scaring with or without a course of oral Isotretinoin.

PATIENTS AND METHODS

This experimental study was conducted in the Baqai Medical University (BMU) and Aziz Fatima Medical and Dental College, Faisalabad, Pakistan, in collaboration with Ball Tree Surgery, Sompting, West Sussex, England. After approval from the ethical committee of Institute, two hundred thirty two patients of mild, moderate and severe post acne/inflammatory scaring irrespective of age, sex and social status were enrolled. Cigarette smokers, alcoholics, pregnant and lactating women and patients having any systemic illness or using any systemic therapy were excluded.

After an informed consent, a detailed history was taken and physical examination was performed in each patient. Patients were divided according to their gender and age. There were One hundred and fifty nine females and seventy three males. All patients were clinically diagnosed. Efficacy variables included non-inflammatory and inflammatory lesions, global grade, and global assessment of improvement in post inflammatory scaring. Skin tolerability variables included erythema, desquamation (scaling), dryness, pruritus, and stinging/burning.

One hundred and fifty nine females were equally divided into two groups i.e. Group F1 of eighty females and Group F2 of seventy nine females. The Group F1 was put on Isotretinoin 20 mg/day after Diamond Dermabrasion for forty five successive

days and seventy nine of group F2 received no further treatment in any means, after the said procedure. In the same way, the males were classified in to two groups, M1 and M2, of thirty seven and thirty six in each group, respectively. These two groups were treated in the same way as the groups of female, M1 was given Isotretinoin 20mg/day and M2 was not given any treatment after diamond dermabrasion. The Diamond Dermabrasion was performed by NOVA NV60. The Isotretinoin 20 mg in capsule form was supplied by Mariline Pharmaceuticals, Karachi, Pakistan.

RESULTS

A total of 159 females and 73 male patients were included in this study. Table I illustrates the evaluation of patients with or without treatment with Isotretinoin after Diamond Dermabrasion in females and male. There were One hundred and fifty nine females. These were divided into two nearly equal groups. Group F1 comprised of eighty individuals and these were processed with Diamond Dermabrasion and then received Isotretinoin 20 mg/day after Diamond Dermabrasion for forty five successive days and seventy nine females of group F2 received no further treatment.

Table I: Evaluation of patients with or without treatment with Isotretinoin after Diamond Dermabrasion according to Gender (Male and female).

	No of Patients with Non-inflammatory lesions	No of Patients with Inflammatory lesions	Erythema	Desquamation (scaling)	Dryness	Pruritus	Stinging/ Burning
Groups (Female, Total No 159)							
Group F1 80 Subjects	66 (82.5%)	14 (17.5%)	64 (80%)	17 (21.25%)	71 (88.7%)	26 (32.5%)	11 (13.7%)
Group F2 79 Subjects	64 (74.6%)	20 (25%)	61 (77.2%)	14 (17.7%)	63 (79.7%)	34 (43%)	19 (24%)
Groups (Male, Total No 73)							
Group M1 37 Subjects	29 (78.3%)	8 (21.6%)	31 (83.7%)	11 (29.7%)	33 (89.1%)	29 (78.3%)	6 (16.2%)
Group M2 36 Subjects	30 (83%)	9 (25%)	34 (94.4%)	13 (36.1%)	30 (83.3%)	28 (77.7%)	10 (27.7)

Out of eighty subjects of Group F1 sixty six (82.55%) presented with Non-inflammatory lesions as compared to the sixty four (74.68%) from group F2 of seventy nine females subsequent to the end of the healing period.

Fourteen (17.5%) women of Group F1 developed mild to moderate inflammatory lesions after the completion of the treatment. In group F2 such patients that developed mild to moderate inflammatory lesions were twenty that makes 25%. Erythema developed in sixty four (80.0%) subjects of Group F1 after the treatment while the same was experienced by sixty one (77.2%) women of Group F2. Desquamation (scaling) was observed in seventeen (21.25%) patients of group F1 while this figure remained fourteen (17.72%) among the group F2. Seventy one (88.75%) out of eighty females of group F1 complained about dryness and in group F2 this parameter was noticed by sixty three (79.74%) subjects. Pruritus was perceived by twenty six (32.50%) of Group F1 females. In contemporary, thirty four (43.03%) subjects of Group F2 grumbled for the same complain. Stinging/Burning was the issue of eleven (13.75%) women of group F1 and nineteen (24.05%) ladies complained for the similar problem in group F2.

Table II: Assessment of female patients with (F1) and without (F2) treatment by Isotretinoin after Diamond Dermabrasion among females.

Global grade for assessment of improvement in post inflammatory scaring		
	Group F1 (80 Subjects)	**Group F2 (79 subjects)**
Grade 0 (poor)	02(2.5%)	11 (13.95%)
Grade 1 (fair)	13 (16.25%)	27 (34.1%)
Grade 2 (good)	41(51.2%)	38 (48%)
Grade 3 (excellent)	24 (30%)	03 (3.8%)

Table II assesses the progress in post inflammatory scaring after Diamond Dermabrasion followed by the treatment with Isotretinoin in Group F1 and in group F2 without isotretinoin. Global grade system for assessment of improvement in post inflammatory scaring was adopted. Out of eighty females, two (2.5%) exhibited no results and thus stood at grade 0. Thirteen women (16.2%), showing reasonable improvement, obtained grade 1. Good prognosis was observed among forty one (51.2%) patients and therefore, Grade 2 was awarded. Twenty four (30%) females were showing outstanding results of Diamond Dermabrasion followed by the treatment with Isotretinoin and were grouped in Grade 3.

Table II also shows the improvement in post inflammatory scaring after Diamond Dermabrasion followed by no treatment in Group F2. Out of seventy nine females, eleven (13.9%) showed no signs of betterment and thus were placed at grade 0. Twenty seven (34%) women, showing sound development, attained grade 1. Good prognosis was observed among thirty eight patients (48%) and therefore, Grade 2 was granted. Only three females (3.8%) were showing excellent results of Diamond Dermabrasion followed by no treatment, thus grouped in Grade 3. Group M1 consisted of thirty seven persons and these were processed with Diamond Dermabrasion and then received Isotretinoin 20 mg/day after Diamond Dermabrasion for forty five successive days and thirty six males of group M2 received no additional medicines in any means, after the said procedure. Out of thirty seven subjects of Group M1 twenty nine (78.37%) presented with Non-inflammatory lesions in contrast to those thirty (83.33%) from group M2 of thirty six males following to the end of the healing period. Eight (21.62%) men of Group M1 developed mild to moderate inflammatory lesions at the end of the treatment. (Table I).

In group M2 such patients that developed mild to moderate inflammatory lesions were nine (25.0%). Erythema developed in thirty one (83.78%) subjects of Group M1 after the treatment while the same was experienced by thirty four (94.44%) guys of Group M2. Desquamation (scaling) was observed in eleven (29.72%) patients of group M1 while this figure remained thirteen (36.11%) among the group M2. Thirty three (89.18%) out of thirty seven males of group M1 were irritated due to dryness and in group M2 this parameter was noticed by thirty (83.33%) subjects. Pruritus was perceived by twenty nine (78.37%) of Group M1 males. In contemporary, twenty eight (77.77%) subjects of Group M2 grumbled for the same complain.

Stinging/Burning was the issue of six men (16.20%) of group M1 and ten (27.77%) gents complained for the analogous trouble. (Table I)

Table III judges the improvement in post inflammatory scaring after Diamond Dermabrasion followed by the treatment with Isotretinoin in Group M1. Global grade system for assessment of improvement in post inflammatory scaring was implemented.

Table III: Assessment of patients with and without treatment by Isotretinoin after Diamond Dermabrasion among males.

Global grade for assessment of improvement in post inflammatory scaring		
	Group M1 (37 Subjects)	Group M2 (36 subjects)
Grade 0 (poor)	04 (10.8%)	02 (5.5%)
Grade 1 (fair)	10 (27%)	19 (52.7%)
Grade 2 (good)	16 (43.2%)	11 (30.5%)
Grade 3 (excellent)	07 (18.9)	04 (11.4%)

Out of thirty seven males, four (10%) revealed no results and thus stood at grade 0. Ten (27%) persons, presented with reasonable improvement, obtained grade 1. Good prognosis was observed among sixteen patients (43%) and therefore, Grade 2 was awarded. Seven males (19%) were showing excellent results of Diamond Dermabrasion followed by the treatment with Isotretinoin and grouped in Grade 3.

The advancement in post inflammatory scaring after Diamond Dermabrasion followed by no treatment with Isotretinoin in Group M2, showed that out of thirty six males, two (5%) were showing no results and thus stood at grade 0. Nineteen persons (52%), presented with reasonable improvement, obtained grade 1. Good prognosis was observed among eleven patients (30%) and therefore, Grade 2 was awarded. Four males (11%) were showing tremendous results of Diamond Dermabrasion followed by no further treatment with Isotretinoin and grouped in Grade 3.

DISCUSSION

Precisely called acne vulgaris, this skin disease affects millions of people annually. It can vary from quite mild to extremely severe. Acne typically develops when the sebaceous glands and the lining of the hair follicle begin to work eventually, as they do in adolescence. Generally, the lining of the hair follicle sheds cells that are carried to the surface of the skin by the sebum. When the follicle is overworked and clogged, cells and sebum accumulate, forming a plug (comedo). About 80 percent of all teenagers develop acne, but this disease can also begin as late as the ages 25 or 30, particularly for women. No one is certain as to what exactly causes acne or why it usually begins in adolescence, but hormones, primarily testosterone, certainly play a large role. A number of other factors, most importantly heredity, are also important.

As discussed earlier, there are two types of managements available for treating acne; topical medicine and oral remedies. Though all of them are good for treating progressive acne, yet the problem comes after treatment of active lesions. The post acne scarring is very common and requires special attention. Many methods and solutions are found and many are in pipe line but the diamond dermabrasion is relatively new and the best technique, revealed until now. The use of oral Isotretinoin in treating active acne is well established but its use after Diamond dermabrasion is still controversial. There are two schools of thoughts, one is in for and the other remains in against. Our purpose for this study was to find effects of Diamond Dermabrasion with or without a course of oral Isotretinoin (20 mg/day after Diamond Dermabrasion for forty five successive days). The patients of group F1 demonstrated fewer Non-inflammatory lesions as compare to the F2 Group. It may be due to anti inflammatory affect of oral Isotretinoin. This result favours the findings of Swinehart JM[7] but dissimilar to the outcome of a study in 2008 by Khunger N, et al.[20] While observing the erythema, desquamation (scaling) and dryness these were found more in Group F1 in contrast to the Group F2. It is due to the usual side effects of the oral Isotretinoin. The same effects were observed by Bagatin E, et al.[21] but that were detected in course of ten days of the same medicine, while Lowenstein EB and Lowenstein E.[22] identified the same after three weeks course of the medicine.

Pruritus and stinging/burning were seen more in Group F2. The Group F1 ladies were showing evidence of less itching and stinging due to anti inflammatory effects of the Isotretinoin. This finding seconds the study of Lowenstein EB and Lowenstein EJ [22] who found the same but the medicine was used for shorter duration. Rigopoulos D, et al.,[23] opposes our opinion as it indicates stinging/burning more while oral Isotretinoin was prescribed to the patients of post acne scaring.

As far as the males were concerned, both the groups were demonstrating approximately the same results. It may be due to the men's skin has more collagen and sebum, which makes it thicker and oilier than women's skin, therefore no obvious difference was noted in Group M1 and M2. This assessment had also been identified by McLane J.[24] Another study also revealed the same conducted by Newman MD,[25] but Zaba R[26] varied as this they discovered more irritation stinging, pruritus in male patients that were treated with oral Isotretinoin for two consecutive months.

When the outcome was evaluated of the oral Isotretinoin after Diamond Dermabrasion striking observation were noticed. In Group F1 the grade 3 of the Global grade for assessment of improvement in post inflammatory scaring were twenty four while the figure was only three in F2 group for the same grade. No or poor results were observed among eleven subjects of grade 0 in F2 group, whereas there were only two females of group F1 that showed no or poor improvement in subsiding the post acne scaring. Approximately the matching findings were also perceived by Jared CJ, et al.[27] A study conducted by Mandy S[28] presented contradictory results yet the number of recruited subject was less.

Almost analogous effect was discovered in comparing the males for the same purpose. Seven subjects of Group M1 came with excellent (grade 3) results. Only four of the group M2 exhibited almost the same results i.e. of grade 3. The group M1 demonstrated far better results than to the compared group M2 while scrutinizing these two groups of males for grade 0. Double the number of individuals showed poor results, of group M1 as compare to the subjects of group M2. The results of our study seconds the findings of a research conducted by Freedman BM[6], but differs to Gold MH[8] who showed no difference in the out come of the oral Isotretinoin after the under discussion procedure. The above noticed finding not only signifying marked decrease in the side/after effects of using oral Isotretinoin after diamond dermabrasion but are also indicative that the outcome of the diamond dermabrasion is better while prescribing oral Isotretinoin.

CONCLUSION

The suggestion of prescription for Isotretinoin following Diamond Dermabrasion is due to the powerful epithelial generation by the vitamin A analogue. This effect provides good and early healing of the abraded skin. It is suggested that further studies may be conducted with larger sample size and improved design to validate the findings.

Acknowledgment
The services of the Meriline Pharmaceuticals Pakistan may be acknowledged, for providing Isotretinoin in 20 mg capsule form and logistics to conduct the research.

REFERENCES

1. James J. Leyden, and James Q. Del Rosso, Oral Antibiotic Therapy for Acne Vulgaris Pharmacokinetic and Pharmacodynamic Perspectives. J Clin Aesthet Dermatol. 2011 February; 4(2): 4047.
2. Addor FA, Schalka S. Acne in adult women: epidemiological, diagnostic and therapeutic aspects. An Bras Dermatol. 2010 Dec;85(6):789-95.
3. Fabbrocini G, Staibano S, De Rosa G, Battimiello V, Fardella N, Ilardi G, Immacolata La Rotonda M, Longobardi A, Mazzella M, Siano M, Pastore F, De Vita V, Vecchione ML, Ayala F. Resveratrol-containing gel for the treatment of acne vulgaris: a single-blind, vehicle-controlled, pilot study. Am J Clin Dermatol. 2011 Apr 1;12(2):133-41.
4. Perić S, Bubanj M, Bubanj S, Jančić S. Side effects assessment in glicolyc acid peelings in patients with acne type I. Bosn J Basic Med Sci. 2011 Feb;11(1):52-7.
5. Kim HS, Lim SH, Song JY, Kim MY, Lee JH, Park JG, Kim HO, Park YM. Skin barrier function recovery after diamond microdermabrasion. Dermatol. 2009 Oct;36(10):529-33.
6. Freedman BM. Topical antioxidant application enhances the effects of facial microdermabrasion. J Dermatolog Treat. 2009;20(2):82-7
7. Swinehart JM.Case reports: surgical therapy of acne scars in pigmented skin. J Drugs ermatol. 2007 Jan;6(1):74-7.
8. Gold MH. Dermabrasion in dermatology. Am J Clin Dermatol. 2003;4(7):467-71.
9. Kunachak S, Leelaudomlipi P, Wongwaisayawan S.Dermabrasion: a curative treatment for melasma. Aesthetic Plast Surg. 2001 Mar-Apr;25(2):114-7
10. Basta-Juzbašić A. Current therapeutic approach to acne scars. Acta Dermatovenerol Croat. 2010 Sep;18(3):171-5. Review.
11. Bayerl C, Degitz K, Meigel E, Kerscher M. Adjuvant dermato-cosmetic acne therapy. J Dtsch Dermatol Ges. 2010 Mar;8 Suppl 1:S89-94
12. Badawi A, Tome MA, Atteya A, Sami N, Morsy IA. Retrospective analysis of non-ablative scar treatment in dark skin types using the sub-millisecond Nd:YAG 1,064nm Laser. Lasers Surg Med. 2011 Feb;43(2):130-6.
13. Emanuele E, Bertona M, Altabas K, Altabas V, Alessandrini G. Anti-inflammatory effects of a topical preparation containing nicotinamide, retinol, and 7-dehydrocholesterol in patients with acne: a gene expression study. Clin Cosmet Investig Dermatol. 2012;5:33-7.
14. Furue M, Yamazaki S, Jimbow K, Tsuchida T, Amagai M, Tanaka T, Matsunaga K, Muto M, Morita E, Akiyama M, Soma Y, Terui T, Manabe M. Prevalence of dermatological disorders in Japan: a nationwide, cross-sectional, seasonal, multicenter, hospital-based study. J Dermatol. 2011 Apr;38(4):310-20.
15. Erturan I, Nazıroğlu M, Akkaya VB. Isotretinoin Treatment induces oxidative toxicity in blood of patients with acne vulgaris: a clinical pilot study. Cell Biochem Funct. 2012, Apr 20.
16. Dispenza MC, Wolpert EB, Gilliland KL, Dai JP, Cong Z, Nelson AM, Thiboutot DM. Systemic Isotretinoin Therapy Normalizes Exaggerated TLR-2-Mediated Innate Immune Responses in Acne Patients. J Invest Dermatol. 2012 Apr 19.
17. Cho SI, Chung BY, Choi MG, Baek JH, Cho HJ, Park CW, Lee CH, Kim HO. Evaluation of the Clinical Efficacy of Fractional Radiofrequency Micro needle Treatment in Acne Scars and Large Facial Pores. Dermatol Surg. 2012 Apr 9.
18. Rao C, Rao R. A cross-sectional study of dermatological problems among differently-abled children. Indian J Dermatol. 2012 Jan;57(1):35-7.
19. Pruthi GK, Babu N. Physical and psychosocial impact of acne in adult females. Indian J Dermatol. 2012 Jan;57(1):26-9.
20. Khunger N; IADVL Task Force. Standard guidelines of care for acne surgery. Indian J Dermatol Venereol Leprol. 2008 Jan;74 Suppl:S28-36.
21. Bagatin E, dos Santos Guadanhim LR, Yarak S, Kamamoto CS, de Almeida FA. Dermabrasion for acne scars during treatment with oral Isotretinoin. Dermatol Surg. 2010 Apr;36(4):483-9.
22. Lowenstein EB, Lowenstein EJ. Isotretinoin systemic therapy and the shadow cast upon dermatology's downtrodden hero. Clin Dermatol. 2011 Nov-Dec;29(6):652-61.
23. Rigopoulos D, Larios G, Katsambas AD. The role of isotretinoin in acne therapy: why not as first-line therapy? facts and controversies. Clin Dermatol. 2010 Jan-Feb;28(1):24-30.
24. McLane J. Analysis of common side effects of isotretinoin. J Am Acad Dermatol. 2001 Nov;45(5):S188-94.
25. Newman MD, Bowe WP, Heughebaert C, Shalita AR. Therapeutic considerations for severe nodular acne. Am J Clin Dermatol. 2011 Feb 1;12(1):7-14.
26. Zaba R, Schwartz R, Jarmuda S, Czarnecka-Operacz M, Silny W. Acne fulminans: explosive systemic form of acne. J Eur Acad Dermatol Venereol. 2011 May;25(5):501-7.
27. Jared Christophel J, Elm C, Endrizzi BT, Hilger PA, Zelickson B. A Randomized Controlled Trial of Fractional Laser Therapy and Dermabrasion for Scar Resurfacing. Dermatol Surg. 2012 Jan 23.
28. Mandy S. A new "spin" on dermabrasion. Dermatol Surg. 2011 Jan;37(1):128.