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Full Length Research Paper

Glycolic acid peeling in the treatment of mild to moderate inflammatory facial acne vulgaris

Sanja Perić[1]*, Maja Bubanj[2], Saša Bubanj[3] and Snežana Jančić[4]

[1]Health Centre in Niš, St. Vojvode Tankosića № 15, 18000 Niš, Serbia.
[2]Pharmacy Niš, St. Zorana Đinđića № 6, 18000 Niš, Serbia.
[3]Department of Kinesiology, Faculty of Sport and Physical Education, University of Niš, St. Čarnojevića № 10a, 18000 Niš, Serbia.
[4]Department of Pathology, Faculty of Medicine, University of Kragujevac, St. Svetozara Markovića № 69, 34000 Kragujevac, Serbia.

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Chemical peeling of the skin involves the topical application of a chemical agent in order to produce a controlled injury to a desired depth, thus allowing subsequent regeneration of the skin which can result in improved texture, more homogeneous pigmentation and less wrinkling. Acne vulgaris is one of the most common skin diseases. The aim of the actual study was to examine and compare the efficiency, skin tolerance and side effects of a 35% glycolic acid combined with antibiotic therapy in patients with inflammatory aspects of acne. The sample consisted of 120 subjects, divided into two experimental sub-samples of 60 subjects each. The first sub-sample consisted of patients with acne papulosa, while the second sub-sample consisted of patients with acne papulopustulosa. The patients from both sub-samples were additionally divided into two groups of 30 patients each. To the first group of 30 patients (within each sub-sample, respectively), glycolic acid in a concentration of 35% was applied after adjusted antibiotic therapy, while to the second group of 30 patients (within each sub-sample, respectively) glycolic acid in a concentration of 35% was applied without previous adjustment of antibiotic therapy. In each sub-sample, the differences in the manifested symptoms of the ailment and the side effects were analyzed. Glycolic acid had a significant effect in the treatment of acne papulosa and acne papulopustulosa, as a monotherapy, as well as combined therapy, that is, after adjusted antibiotic therapy. Side-effects were experienced by patients treated only by glycolic acid, that is, without previously adjusted antibiotic therapy. Glycolic acid chemical peels in concentration of 35% had overall efficiency and a superior therapeutic effect and are recommended by the authors after adjusted antibiotic therapy. The appearance and intensity of side effects in patients after adjusted monotherapy, adduced us to the choice of combined therapeutic treatment.

Key words: Acne papulosa, acne papulopustulosa, chemical peeling, glycolic acid.

INTRODUCTION

The benefits of glycolic acid (GA) for chemical peeling have been recognized for a long time (Gupta et al., 2001). Chemical peeling of the skin involves the topical application of a chemical agent in order to produce a controlled injury to a desired depth, thus allowing subsequent regeneration of the skin which can result in improved texture, more homogeneous pigmentation and less wrinkling. It is a relatively low-cost, simple procedure and healing thereafter is usually quite rapid (Brody, 1995). Chemical peels cause corneocyte dysadhesion or epidermolysis to the stratum granulosum layer. GA (2-hydroxyethanoic acid), originally produced from sugar cane is the smallest molecule and therefore penetrates

*Corresponding author. E-mail: sanjaperic67@gmail.com. Tel: +381 (18) 210999. Fax: + 381 (18) 241047.

the epidermis the best and has the greatest utility with respect to chemical peeling (Yu and Van Scott, 1994). The application of the GA decrease corneocyte cohesion at the lower levels of the stratum corneum (potentially dislodging comedones and preventing their formation) as well as improving the skin surface cosmetically (Zakopoulou and Kontochristopoulos, 2006). Concentrations of GA up to 40% result in epidermolysis (Van Scott and Yu, 1974). Greater concentrations also increase collagen, mucopolysaccharide and hyaluronic acid production and increase skin thickness (Plewing, 2009; Green et al., 2009; Bisset, 2009; Green, 2005; Yu and Van Scott, 2005). Acne vulgaris is one of the most common skin diseases.

Peak incidence occurs during adolescence and affects approximately 85% of young people between 12 and 24 years of age (Zaenglein and Thiboutot, 2008). Acne has four main pathogenic features: sebum overproduction, follicular hyperkeratinization, propionibacterium acnes colonization and inflammation (Plewing, 2009; Zouboulis et al., 2005; Pawin et al., 2004; Katsambas et al., 2004). Although the initiating factor remains unknown, it was once thought that keratinocytes within the follicle become cohesive and plug the follicle. Hyperkeratinisation plays an important role in the pathogenesis of acne, and is usually a result of decreased desquamation due to increased corneocyte cohesion (Leyden, 1995). Excessive sebum production is one of the major factors contributing to the formation of acne lesions (Cunliffe et al., 2003; Abramovits and Gonzales-Serva, 2000). At this point, propionbacteria colonize the follicle and comedones. At earlier or later stages of the comedo development, an inflammatory phenomenon appears, ranging from subtle to severe. The inflammatory cascade is up-regulated by immunological factors. Chemical exfoliation resulting in the reduction of keratotic plugs serves as a second-line treatment used as an adjunct to topical anti-acne agents and systemic antibiotics (Kempiak and Uebelhoer, 2008). The effects of GA in the treatment of acne is achieved; thanks to the epidermolysis leading to the removal of the roof of papules and pustules (Bourelly and Lotsikas-Baggili, 2005; Webster, 2005). GA can also correct abnormal keratinization in acne (Green, 2005).

The aim of the current study was to examine and compare the efficiency, skin tolerance and side effects of a 35% glycolic acid in patients with inflammatory aspect of acne, among whom some patients adjusted antibiotic therapy (AT), while others did not adjust the mentioned procedure.

MATERIALS AND METHODS

Patients

The examination was performed in the Cabinet for Venereal and Skin Diseases and the Department of Esthetic Medicine of the Health Centre in Niš. All of the patients were familiar with the procedures of the therapy which was conducted in accordance to the Helsinki Declaration. The type and severity of acne vulgaris in each patient were assessed by means of the Leeds technique (O' Brien et al., 1998; Burke and Cunliffe, 1984), and only patients with superficial inflamed lesions (papules and papulopustules) were included in the study. The selection of subjects was based on clinical analysis and anamnestic data. In the current study, 120 patients received 8 serial glycolic acid peels, during two week intervals, for 16 weeks in total. The GA solution was applied to the face of the patients (Glycolic acid peels; Neostrata, Princeton, NJ, USA) in concentrations of 35%. The patients were divided into two sub-samples of 60 patients each. The first sub-sample consisted of patients with acne papulosa, while the second sub-sample consisted of patients with acne papulopustulosa. The patients from both sub-samples were additionally divided into two groups of 30 patients each. To the first group of 30 patients (within each sub-sample, respectively), GA in a concentration of 35% was applied after adjusted AT. AT treatment was conducted by giving one tablet of azithromycin in a dose of 500 mg, once a day, for three consecutive days, after which one tablet of azithromycin in a dose of 500 mg was given once a week for the next six weeks. To the second group of 30 patients (within each sub-sample, respectively) GA in a concentration of 35% was applied without previous adjustment of AT.

The testing areas were 5 × 5 cm, left and right cheek, parallel. Before each peel, the patients were advised to wash their faces. After patting the face dry, cleansing was done with cleanser (Pre-peel Cleanser; Neo strata) to remove cutaneous oils. The first peel started with minimum contact time of 2 min. The following contact times increased to a maximum of 6 min. GA was neutralized with 10% bicarbonate solution. All of the subjects went through the complete treatment as required by protocol. During the entire 6-month period, the patients were advised to use a broad-spectrum sunscreen with sun protection factor (SPF) 30 and to avoid sun exposure strictly. Monitored symptoms which included the number of comedones, papules, papulopustules and the greasy face look were considered as the criteria of the treatment's efficiency, while erythemes, desquamation and the sensation of dry facial skin were considered undesirable (side) effects which could negatively affect the quality of life.

Statistical analysis

For the data statistical analysis and interpretation of the results, the software "SPSS version 13" was used. The results were expressed through descriptive statistics, as simple frequencies, whereas the non-parametric Friedman's test was used for establishing the statistically significant differences.

RESULTS

In the sub-sample of patients with acne papulosa, during a sixteen-week follow-up period, the number of comedones and papules in both therapeutic groups was significantly reduced (Friedman's test, $p = 0.000$). By the twelfth week of therapy, 96.7% of the patients in both therapeutic groups had no comedones. In the fourteenth week of therapy in the group of patients with previously adjusted AT, 100% of the patients had no comedones, and after the sixteenth week of the treatment in the group of patients which applied GA immediately that is, without

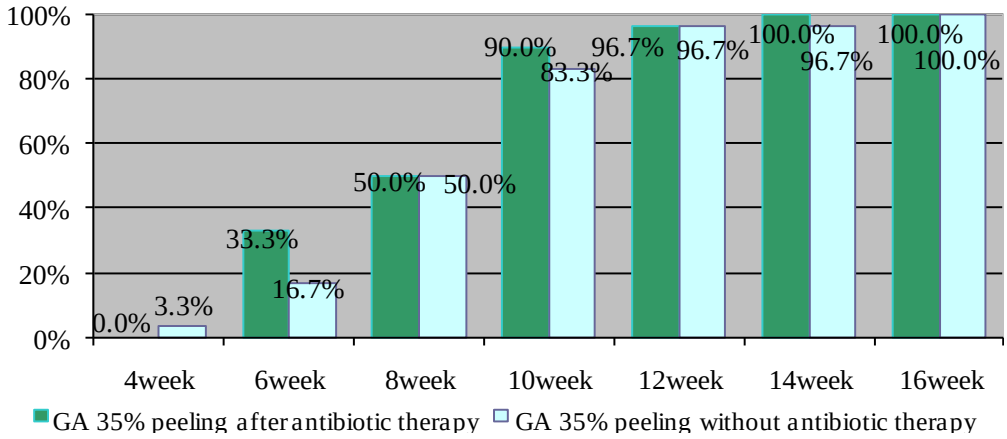

Figure 1. Time of comedones loss in the patients of the first sub-sample.

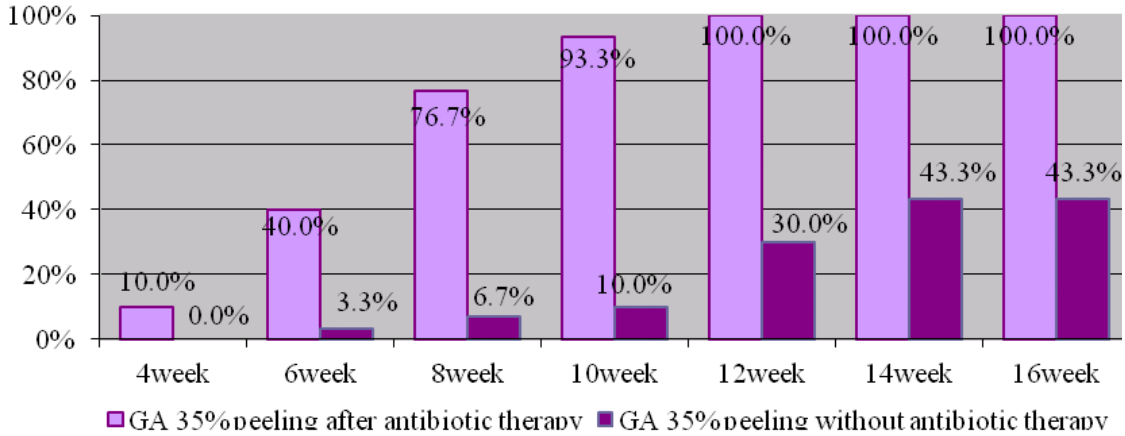

Figure 2. Time of papules loss in the patients of the first sub-sample.

any previously adjusted AT, no patient had comedones (Figure 1). By analyzing the withdrawal of the papules in the group of patients with previously adjusted AT, after the twelfth week of therapy there was a complete loss of papules, while in the group of patients which applied GA immediately that is, without any previously adjusted AT, after the therapy there was a loss of papules in 43.3% of the patients (Figure 2). During the sixteen week follow-up period, the results of the side effects in both analyzed groups of patients with acne papulosa, that is, the incidence of erythema, desquamation and the sensation of pulling, as well as their intensity, differed in a statistically significant manner (Friedman's test, p = 0.000). The side effects were statistically significantly higher in the group of patients which applied only GA peels. By the end of the sixteenth week of therapy in the group of patients where GA was applied after adjusted AT, 76.7% of the patients had weak erythema, 13.3% of the patients had moderate erythema, while there was no patient with severe erythema.

Concerning the group of patients where GA peels were applied immediately that is, without any previously adjusted AT, 60% of the patients had moderate erythema and 16.7% of the patients had severe erythema (Figure 3). The incidence of slight desquamation and a slight sensation of pulling in the group of patients which applied GA after adjusted AT was low (50, 53.3%, respectively), 43.3% of the patients had moderate desquamation and the sensation of pulling, while in the group of patients where GA peels were applied immediately, that is, without previously adjusted AT, 53.3% of the patients had moderate desquamation and a moderate sensation of pulling and 43.3% of the patients had severe desquamation and a severe sensation of pulling (Figure 4). In the sub-sample of patients with acne papulopustulosa during the sixteen-week follow-up period, the number of comedones, papules and papulopustular acnes in both therapeutic groups was

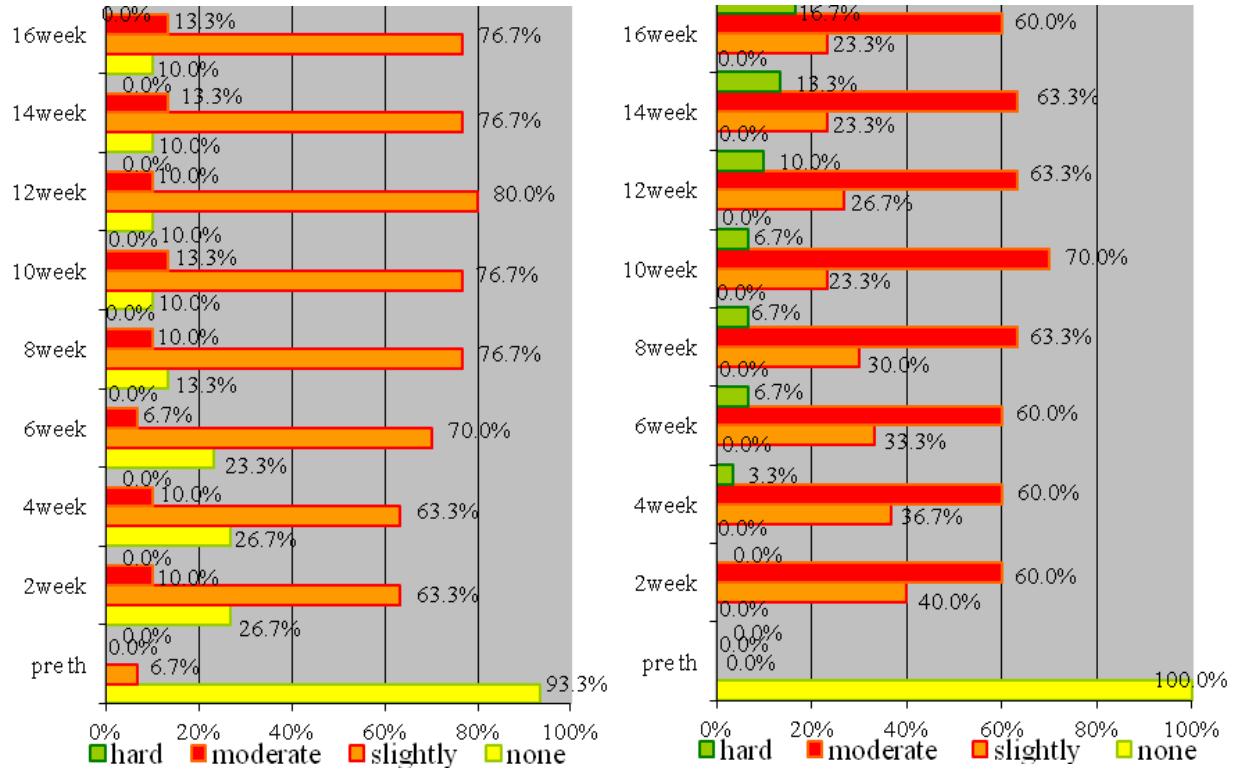

Figure 3. Incidence in appearance of erythema in the patients of the first sub-sample, that is, in the group where GA was applied after adjusted AT (left) and the group where GA was applied without any previously adjusted AT (right).

significantly reduced (Friedman's test, p = 0.000). From the twelfth week of therapy, in the group of patients where GA was applied after adjusted AT, no patient had comedone, while in the group of patients where GA peels were applied immediately, no patient had comedone in the sixteenth week that is, at the end of the study (Figure 5). By analyzing the withdrawal of the papules in the group of patients with previously adjusted AT, after the therapy there was a loss of papules in 83.3% of the patients, while in the group of patients where GA was applied without previously adjusted AT, after the therapy there was a loss of papules in 76.7% of the patients (Figure 6). The number of papulopustulosa in both analyzed groups was significantly reduced.

At the end of the therapy, in the group of patients treated with GA peels after adjusted AT, 83.3% of the patients had no acne papulopustulosa. Concerning the group of patients which applied GA peels without any previously adjusted AT, 80.0% of the patients showed no sign of papulopustular acne (Figure 7). By the end of the sixteenth week of the therapy in the group of patients where GA was applied after adjusted AT, 60% of the patients had a weak erythema, 40% of the patients had no erythema, that is, and no patient had moderate and severe erythema. Concerning the group of patients where GA peels were applied immediately, that is, without any previously adjusted AT, 3.3% of the patients had weak erythema, 40% of the patients had moderate erythema and 56.7% of the patients had severe erythema (Figure 8). The incidence of severe desquamation and severe sensation of pulling in the group of patients after adjusted AT was 0%. Namely: 86.7% of the patients had slight desquamation and a slight sensation of pulling, 3.3% of patients had moderate desquamation and moderate sensation of pulling, while in the group of patients where GA peels were applied immediately, that is, without any previously adjusted AT, 90% of the patients had severe desquamation and a severe sensation of pulling and 10% of the patients had moderate desquamation and a moderate sensation of pulling (Figure 9).

DISCUSSION

Recent interest in GA peeling has been rekindled by the work of Yu and Van Scott (2005) and Van Scott and Yu (1974). According to the aforementioned authors, GA in low concentrations caused a decrease in corneocyte cohesion, but at higher concentrations it resulted in epidermolysis and upper dermal changes producing vibrant, less wrinkled, more uniformly colored skin. The application of GA in concentrations of 10 to 30% is

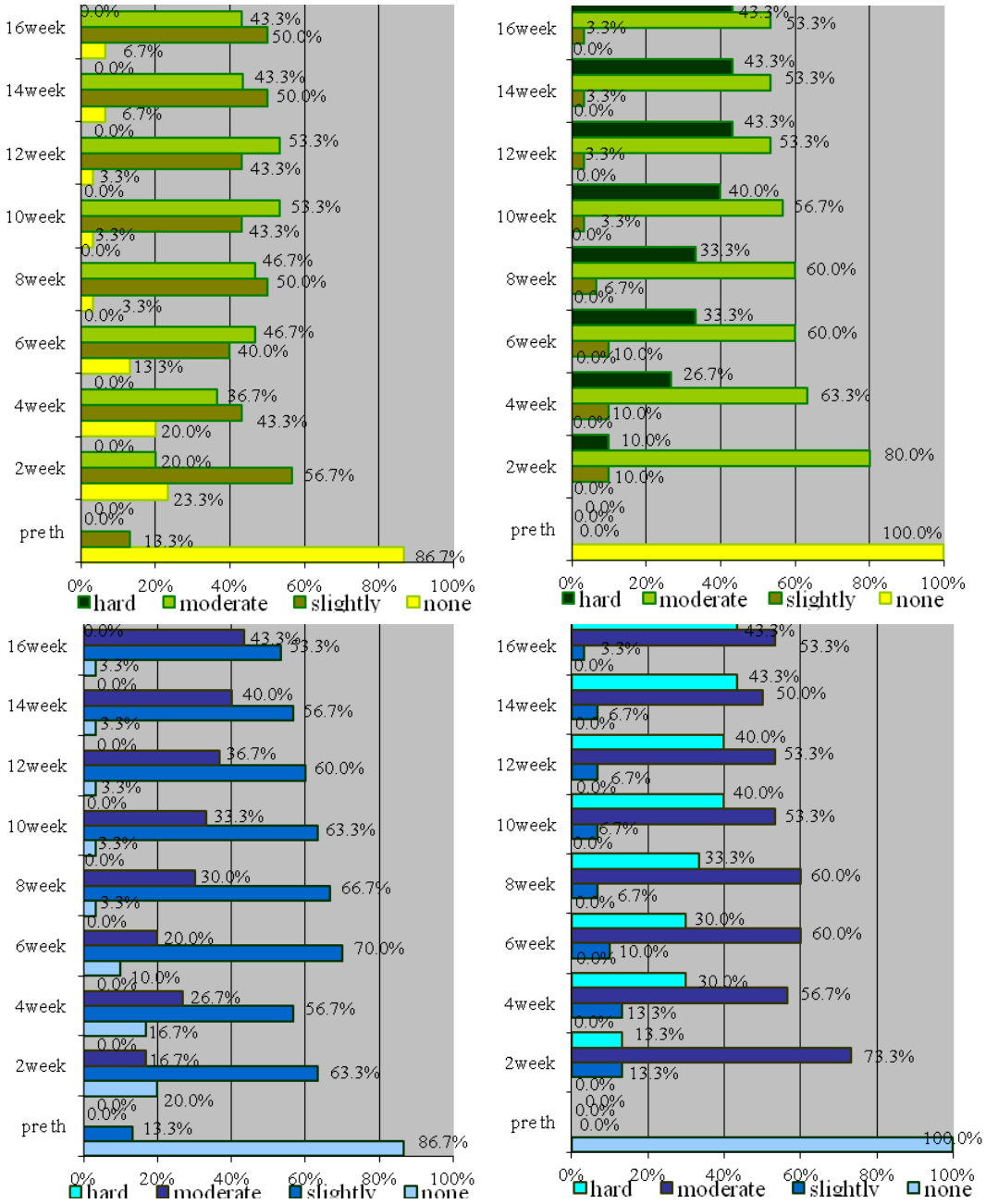

Figure 4. Incidence in desquamation (green bars) and sensation of pulling (blue bars) in patients of the first sub-sample that is, in the group where GA was applied after adjusted AT (left) and the group where GA was applied without any previously adjusted AT (right).

described in the literature for the treatment of acne vulgaris (Lee et al., 2006; Erbagci and Akcali, 2000) which is in accordance with the methodological approach of the current study. The sixteen-week long period of monitoring is in accordance with the research period of some other studies (Lee et al., 2006), as well as an intermittent two-week long treatment (Erbagci and Akcali, 2000). In a recent study designed by Grover and Reddu (2003), 10 to 30% GA applied at night intervals showed signs of moderate success in acne patients. In another study conducted by Wang et al. (1997), 40 acne vulgaris patients with skin type IV were treated by four series of 30 to 50% GA peels every 3 weeks. At the end of the study, a significant resolution of comedones, papules, and pustules was observed, and it was stated that a GA peel might be an ideal adjunctive treatment of acne. In a

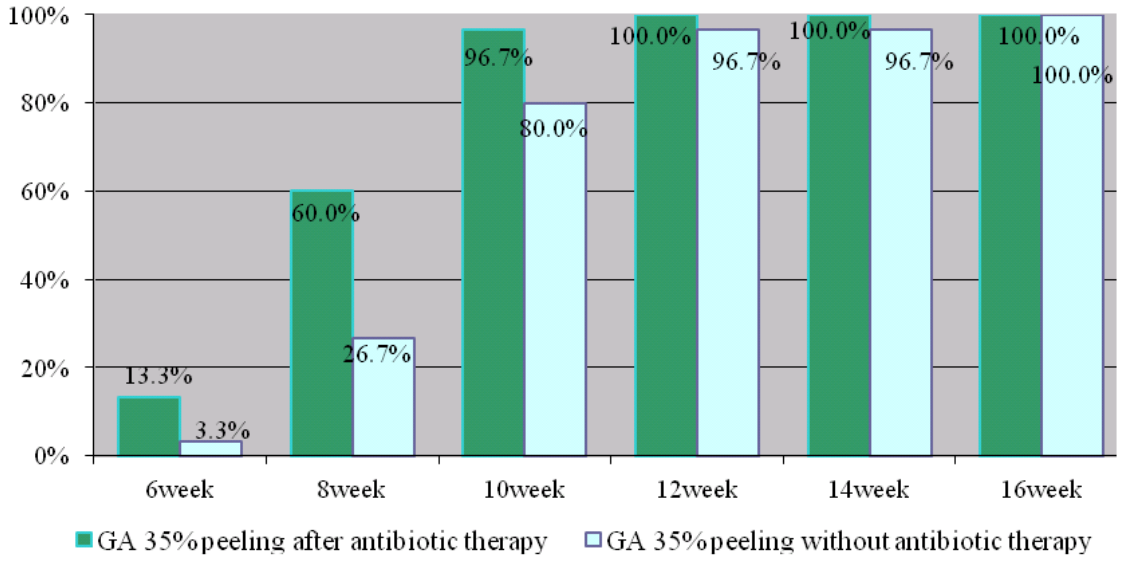

Figure 5. Time of comedones loss in the patients of the second sub-sample.

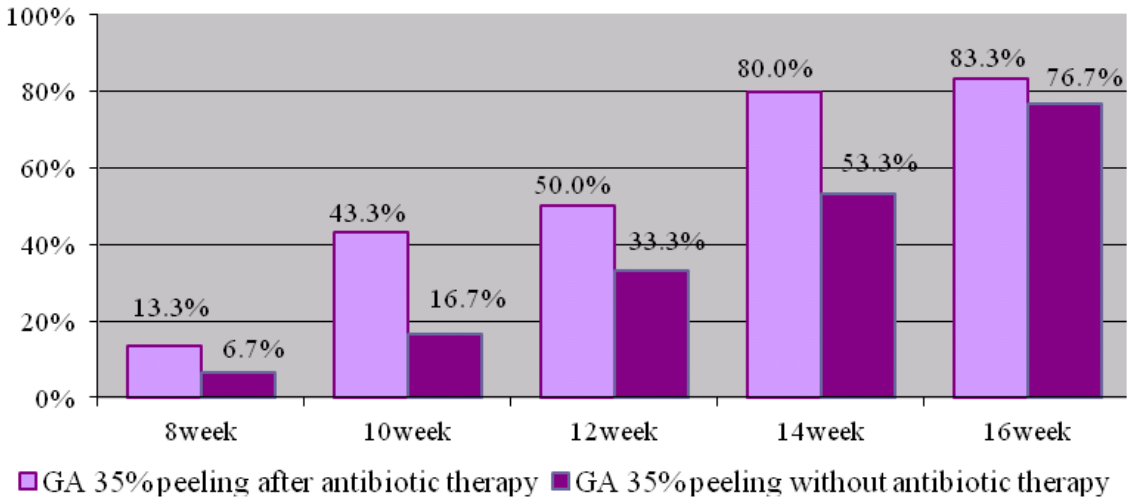

Figure 6. Time of papules loss in the patients of the second sub-sample.

study conducted by Atzori et al. (1999), 70% GA peeling was adjusted on sample of 80 female acne vulgaris patients (32 cases with comedonic acne, 40 cases with papulo-pustular acne and eight cases with nodular-cystic acne).

In the aforementioned study, it was reported that GA peels are an effective treatment for all acne types, mainly comedonic acne, which is in accordance with the results of the current study. The current study aimed to explore the effects of GA in concentrations of 35% in the therapy of acne papulosa, as a monotherapy, as well as combined therapy, that is, after adjusted AT in accordance to the guidence for this stadium of acne. The study used the methodological approach which considered separated symptoms and side effects, and which is in accordance with the contemporary description of other authors (Erbagci and Akcali, 2000). The current study determined the state of objective parameters (comedones, papules, papulopustules and the greasy face look), which is in accordance with the reports of Grimes et al. (2004) and Kim et al. (1999). Namely: the aforementioned authors confirmed a reduction in objective parameters. The efficiency of the therapy was estimated to be 92%, which is in accordance with the results of the current study. Kim et al. (1999) reported low side effects and recommended peelings with GA in

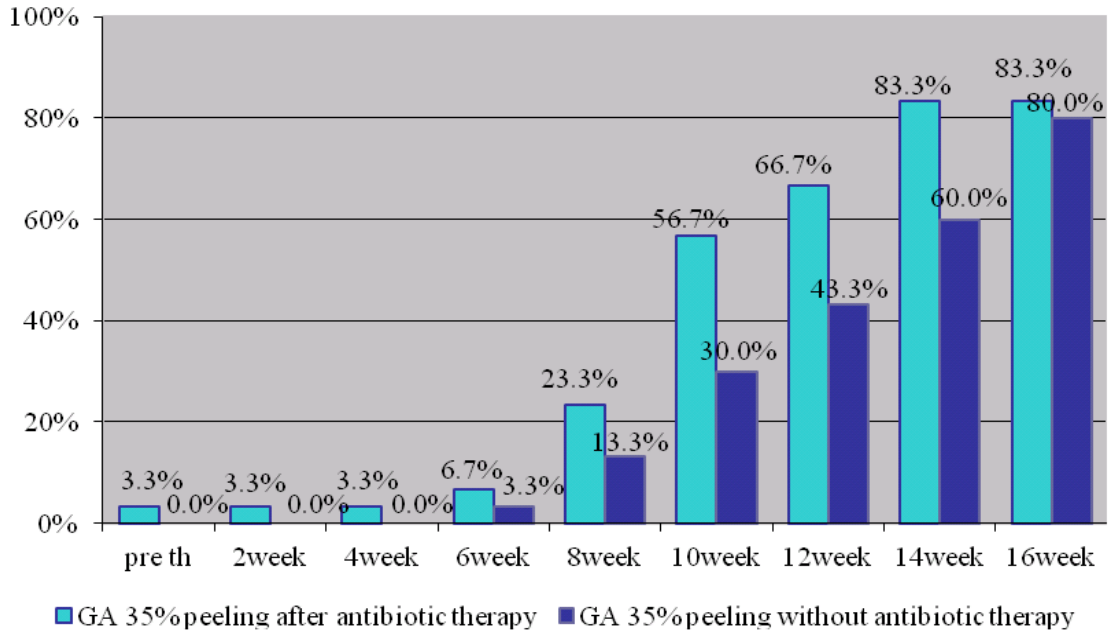

Figure 7. Time of papulopustular acnes loss in the patients of the second sub-sample.

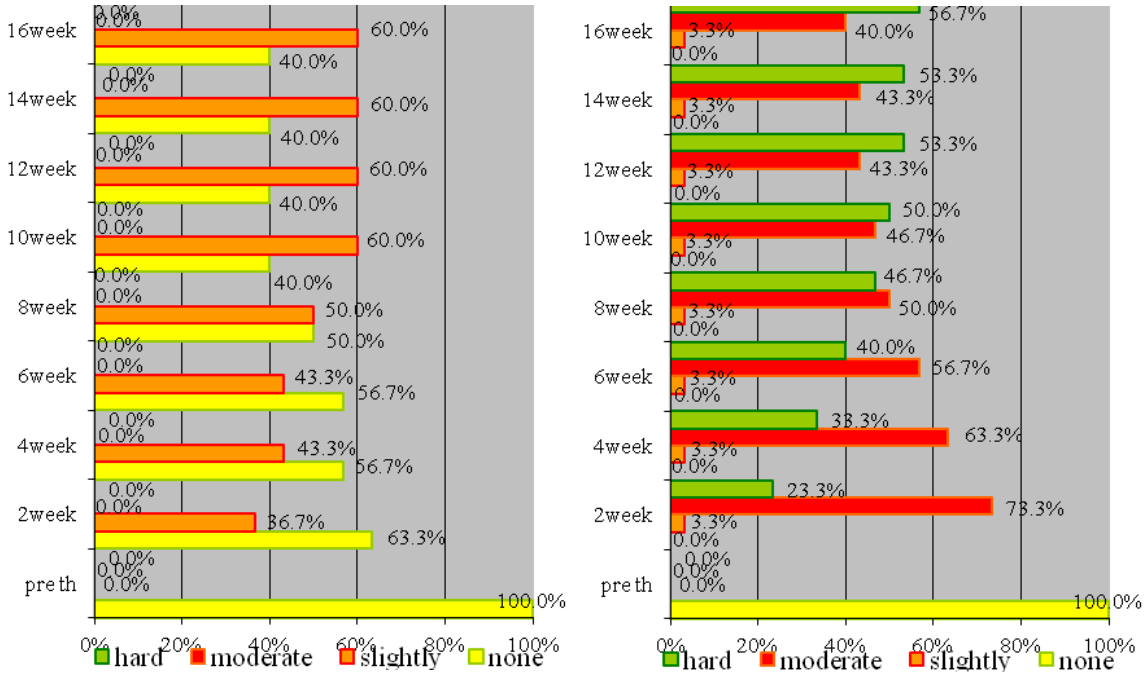

Figure 8. Incidence in appearance of erythema in the patients of the second sub-sample that is, in the group where GA was applied after adjusted AT (left) and the group where GA was applied without any previously adjusted AT (right).

concentrations of 50%. The results of the study conducted by Ul Bari et al. (2005), which included 268 patients, pointed out the statistically significant effect of the superficial peeling therapy in acne vulgaris patients, and also the very low incidence of side effects. Similarly, the results of studies conducted by Perić et al. (2011) and

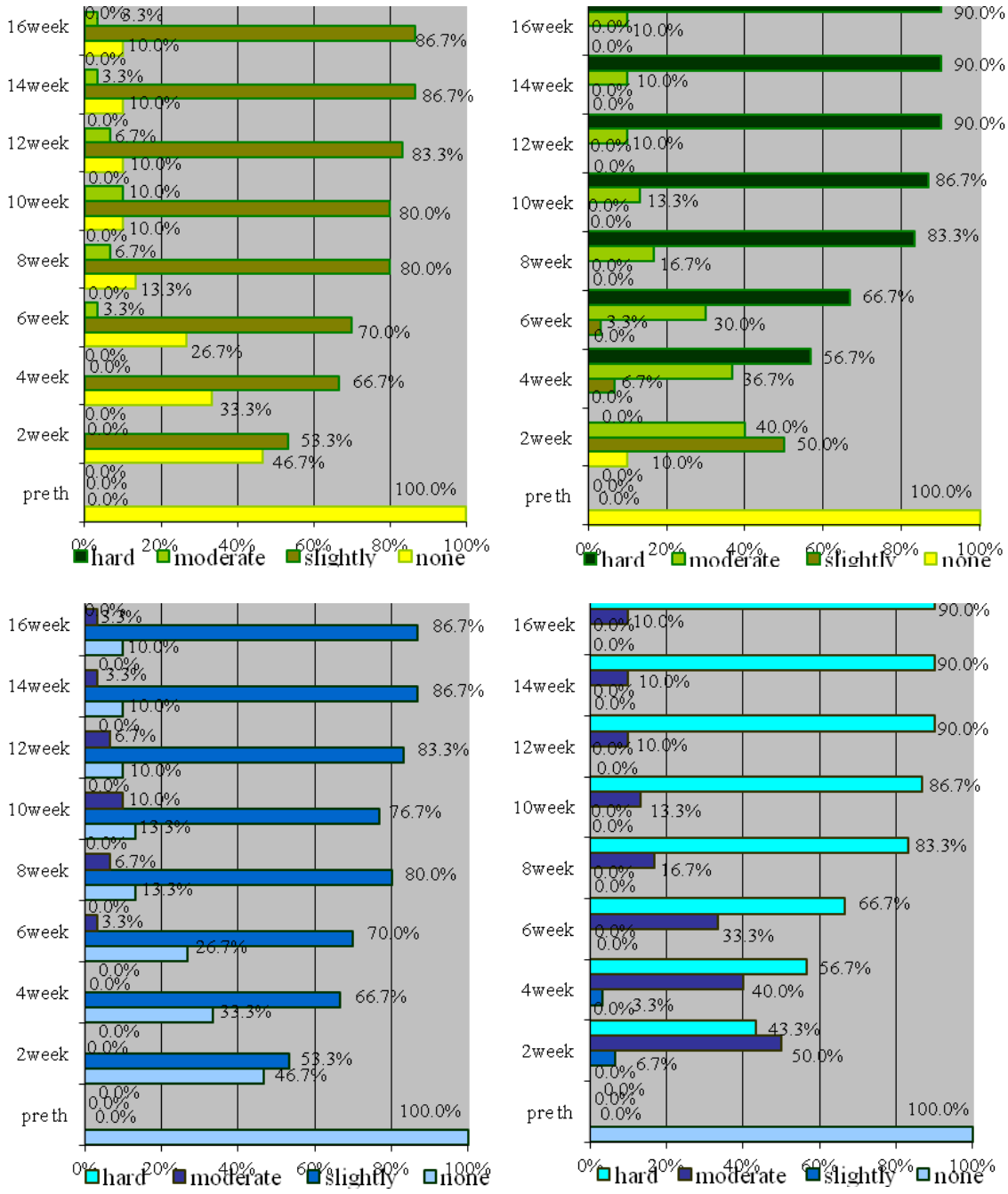

Figure 9. Incidence in desquamation (green bars) and the sensation of pulling (blue bars) in patients of the second sub-sample that is, in the group where GA was applied after adjusted AT (left) and the group where GA was applied without any previously adjusted AT (right).

Perić et al. (2008) recomend GA peelings as a safe procedure.

In a recent study, Garg et al. (2009) compared the efficacy and tolerability of 35% GA peels and 20% salicylic-10% mandelic acid peels in active acne. In conclusion, the 20% salicylic- 10% mandelic acid peels had a higher efficacy on most active acne lesions and the side effects were reduced with 20% salicylic-10% mandelic acid peels. In this study, both peeling methods played an effective role in the decline of the number of comedones starting from the first month in acne patients.

The side effects of peelings, like scars, infections and

jagged pigmentation were described by Resnik S and Resnik B (1995), and confirmed by the results of Erbagci and Akcali (2000). Grover and Reddy (2003) also determined the presence of side effects in 9% of the patients. The results of the current study suggest a statistically significant increment in the side effects, that is, erythema, desquamation and sensation of pulling in all four groups of analyzed patients (Friedman's test; p = 0.000). The number of studies in which GA peels are compared with other peels is not large. In a split-face study designed by Kim et al. (1999), the efficacy of 70% GA and Jessner's solution (resorcinol, salicylic acid, lactic acid in ethanol) was compared. It was found that both treatments work equally well in the treatment of acne vulgaris and a minor degree of exfoliation on the GA side was determined. In another split-face, double-blind trial conducted by Kessler et al. (2008), a 30% GA peel was compared with a 30% salicylic acid peel and it was found that both peels were similarly effective with fewer side effects seen on the salicylic acid-treated side. Langner et al. (2008), Andres et al. (2008); Kircik (2007), Tanghetti et al. (2008) and Katsambas et al. (2004) in their studies also confirmed the effect of combined therapy in the treatment of acne vulgaris which is in accordance with the results of the current study.

By insight of the results in all of the patients that is, patients with acne papulosa and patients with acne papulopustulosa (respectively), there is statisticaly significant decrement in the illness symptoms. The difference in apperance and intensity of side effects lead us to the choise of combined therapeutic treatment which is in accordance wih the aforementioned studies.

Conclusion

GA chemical peels in concentrations of 35% are an effective treatment for inflammatory aspect of acne and are recommended by the authors of the current study after adjusted antibiotic therapy. The appearance and intensity of the side effects in patients after adjusted monotherapy led us to the choice of combined therapeutic treatment.

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