Results

A total of sixty patients were enrolled in the study. Among the sixty patients, 58 were females and 2 were males, with age range from 16 – 33 years. All the sixty patients were classified into 3 groups:

Group I : 20 patients treated with only one session of cryotherapy, had a range of age from 16-33 years, with a mean of 20.9 ± 4.9.

Group II : 20 patients treated with trichloroacetic acid 18% once per week for 12 weeks, had a range of age from 16-25 years, with a mean of 19.7 ± 2.7.

Group III : 20 patients treated with mandelic acid 50 % once per week for 12 weeks, had a range of age from 17-30 years, with a mean of 22.1 ± 4.5 **(Table 2)**.

There was no statistical significant difference between the 3 studied groups as regard the age of onset of freckles. **(Table 3**) .

There was no statistical significant difference between the 3 studied groups as regard the skin phototype, (**Table 4).**

Regarding the improvement % in the 3 studied groups, there was no statistical significant difference, where there was moderate to marked improvement (>50 % lightening) in 14 patients (70%), 8 patients (40%) and 14 patients (70%) in groups I, II and III respectively **(Table 5)**.

Regarding the beginning of improvement of freckles in groups II and III, there was no statistical significant difference between the two groups, where

5 patients (25%) showed improvement after 2 weeks in each group, and 11 patients (55%) and 8 patients (40%) showed improvement after 4 weeks in groups II and III respectively **(Table 6).**

There was a highly statistical significant relation between the improvement % and skin phototype among all cases , where there was more better improvement in lower skin types (skin types I and II) and less improvement in dark skin types **(Table 7)**.

Marked improvement in skin type I was found in 16.6% , 75% and 12.5% of patients in groups I,II and III respectively, whereas these results were 67.8% , 25% and 75% of patients in groups I,II and III respectively in skin type II. These findings showed a significant statistical difference in skin type I where TCA was more better, and a significant statistical difference in skin type II were mandelic acid was better **(Table 8)** .

We found that the more the age of patients, the better the improvement, by using the one way Anova test (F test), this relation was statistically non significant among group I (cryotherapy group), while among groups II (TCA group) and III (Mandelic acid group) it was statistically highly significant **(Table 9)**.

We found also that the more the ages of onset of freckles, the better the improvement, by using the one way Anova test (F test), this relation was statistically significant among group I (cryotherapy group), statistically highly significant among group II (TCA group), and statistically non significant among group III (mandelic acid group) **(Table 10)**.

There was no statistical significant relation between the recurrence rate after 4 months among the 3 studied groups , where 11 patients (55%), 6 patients (30%), and 13 patients (65%) among groups I, II, and III respectively showed recurrence of freckles **(Table 11)**.

Regarding the relation between the recurrence rate and skin phototype among the 3 studied groups, it was found that the lighter skin types showed recurrence more than the darker skin types. This relation was statistically significant among group I (cryotherapy group), whereas among groups II (TCA group) and III (mandelic acid group) it was statistically non significant **(Table 12)**.

There was a highly statistical significant difference between the 3 studied groups as regard the speed of healing of lesions, where 16 patients (80 %), 13 patients (65%) and 20 patients (100 %) among groups I, II and III respectively showed complete healing within 7 days, so patients treated with mandelic acid were the quickest to be healed **(Table 13)**.

The reported side effects among the 3 studied groups were post-inflammatory hyperpigmentation (PIH), erythema and brownish crusts. Regarding the post-inflammatory hyperpigmentation, it was found that 2 patients (10%) in group I and 2 patients (10%) in group II showed PIH compared with 0% in group III. It was found that all the 4 patients who showed PIH were of skin type IV. Regarding the erythema, it was found that 20 patients (100%) in groups II and III showed erythema on the first day compared with 6 patients (30%) in group I. Regarding the brownish crusts, it was found that 20 patients (100%) in groups I and II showed brownish crusts compared with 0% in group III **(Table 14)**.

Table 2 : Means ($\bar{x}$) and standard deviations (SD) of age :

Group	Group I	Group II	Group III
Range	16- 33 years	16-25 years	17-30 years
$\bar{x}$	20.9	19.7	22.1
± SD	± 4.9	± 2.7	± 4.5
F value	1.648		
P value	>0.05		
significance	NS		

There was no significant statistical difference in age of patients between the 3 studied groups.

Table 3 : Means ($\bar{x}$) and standard deviations (SD) of ages of onset :

Group	Group I	Group II	Group III
Range	10- 16 years	9-17 years	10-15 years
$\bar{x}$	12.1	12.7	12.3
± SD	± 1.9	± 2.4	± 1.8
F value	0.512		
P value	>0.05		
significance	NS		

There was no significant statistical difference in age of onset of freckles between the 3 studied groups

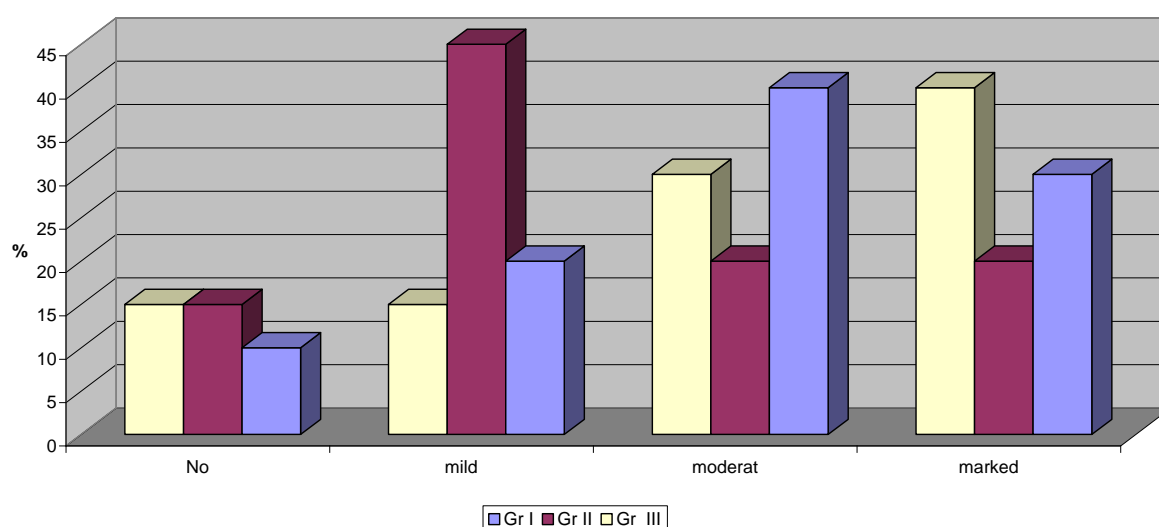**Table 4 : Skin phototype of patients among the 3 studied groups .**

Group / Skin phototype	Group I		Group II		Group III		Total	
	No.	%	No.	%	No.	%	No.	%
Type I	2	10.0	4	20.0	2	10.0	8	13.3
Type II	9	45.0	7	35.0	10	50.0	26	34.4
Type III	7	35.0	7	35.0	7	35.0	21	35.0
Type IV	2	10.0	2	10.0	1	5.0	5	8.3
Total	20	100.0	20	100.0	20	100.0	60	100.0
Chi square (x^2)	1.938							
P value	>٠.٠٥							
Significance	NS							

There was no significant statistical difference in skin phototype between the 3 studied groups .

Table 5 : The relation between the 3 studied groups as regard the improvement %.

Group Improvement %	Group I		Group II		Group III		Total	
	No.	%	No.	%	No.	%	No.	%
No improvement (< 25% lightening)	2	10.0	3	15.0	3	15.0	7	11.7
Mild (25-49% lightening)	4	20.0	9	45.0	3	15.0	13	21.7
Moderate (50-75%)	8	40.0	4	20.0	6	30.0	19	31.6
Marked (>75 %)	6	30.0	4	20.0	8	40.0	21	35.0
Total	20	100.0	20	100.0	20	100.0	60	100.0
Chi square(x^2)	6.79							
P value	> 0.05							
Significance	NS							

There was no significant statistical difference in the improvement % between the 3 studied groups.

Chart (1) The relation between the 3 studied groups as regard the improvement %

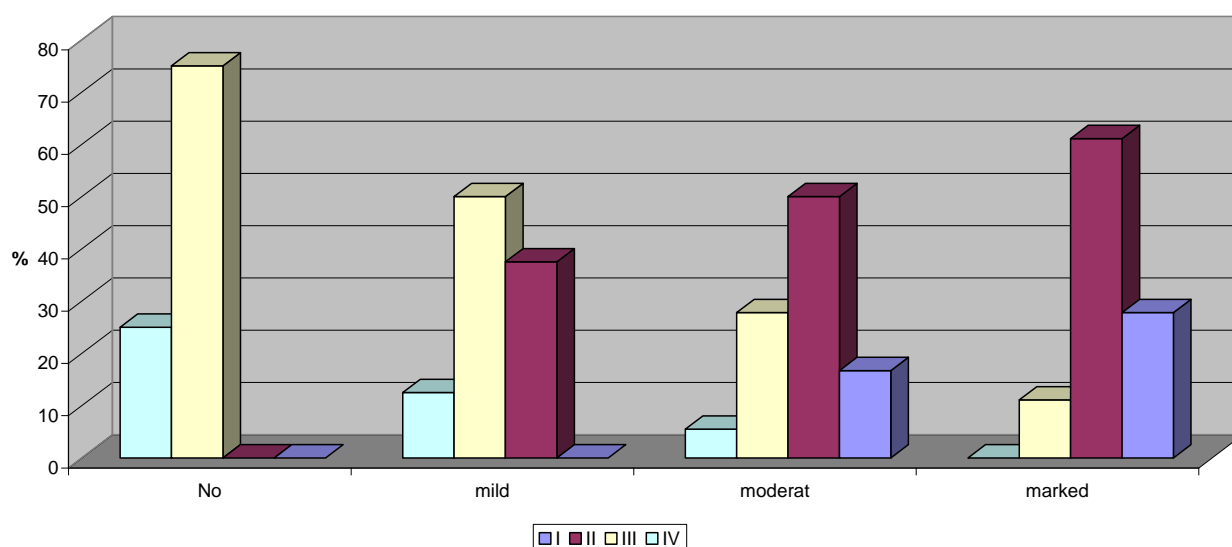**Table 6 : The beginning of improvement in groups II and III .**

Group / Beginning Improvement	Group II		Group III		Total	
	No.	%	No.	%	No.	%
After 2 weeks	5	25.0	5	25.0	10	25.0
After 4 weeks	11	55.0	8	40.0	19	47.5
After 6 weeks	1	5.0	4	20.0	5	12.5
Total	20	100.0	20	100.0	40	100.0
Chi square(x^2)	3.39					
P value	> 0.05					
Significance	NS					

There was no significant statistical difference in the beginning of improvement of freckles between groups II and III .

Table 7 : The relation between the improvement % and skin phototype among all cases.

Improvement % Skin phototype	No		Mild		Moderate		Marked		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
I	0	0.0	0	0.0	3	16.7	5	27.8	8	13.3
II	0	0.0	6	37.5	9	50.0	11	61.1	26	43.3
III	6	75.0	8	50.0	5	27.8	2	11.1	21	35.0
IV	2	25.0	2	12.5	1	5.5	0	0.0	5	8.4
Total	8	100.0	16	100.0	18	100.0	18	100.0	60	100.0
Chi square (x^2)	23.8									
P value	<0.0٠١									
Significance	HS									

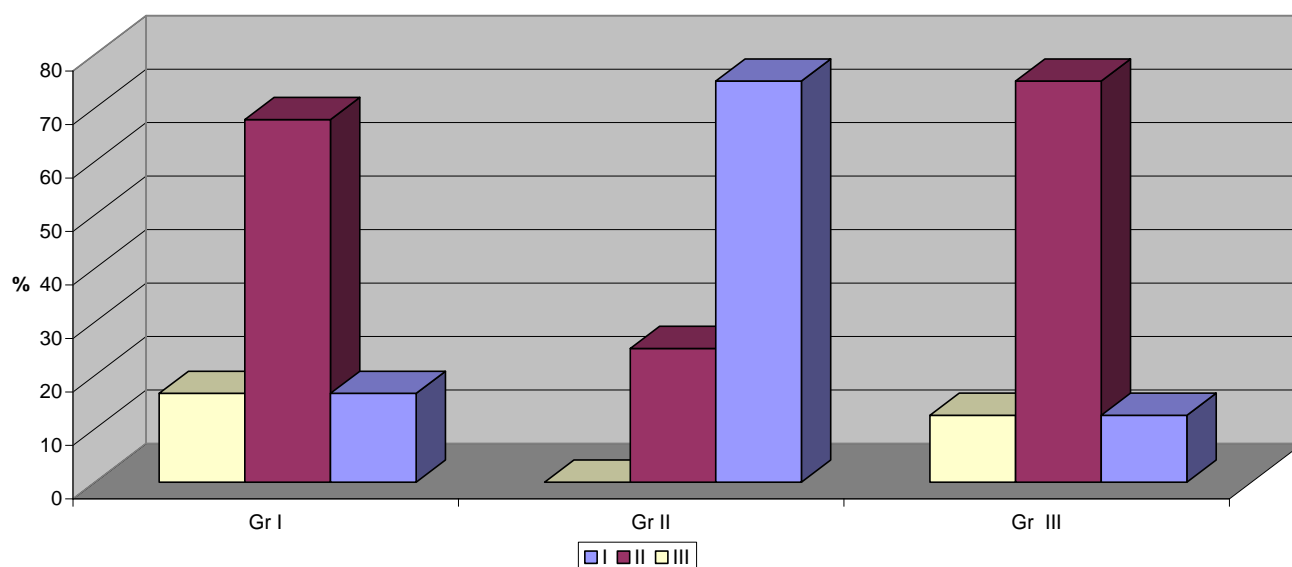The relation between the improvement % and skin phototype among all cases was statistically highly significant.

Chart (2) The relation between the improvement % and skin phototype among all cases

Table 8 : The relation between marked improvement among the 3 studied groups according to skin phototype.

Marked improvement / Skin phototype	Group I		Group II		Group III		Chi square (x^2)	P value	Significance
	No.	%	No.	%	No.	%			
I	1	16.6	3	75.0	1	12.5	5.75	<0.05	S
II	4	67.8	1	25.0	6	75.0	5.92	<0.05	S
III	1	16.6	0	0.0	1	12.5	0.54	>0.05	NS
Total	6	100.0	4	100.0	8	100.0	—	—	—

The relation between the marked improvement among the 3 studied groups according to skin phototype was statistically significant in skin phototype I and II.
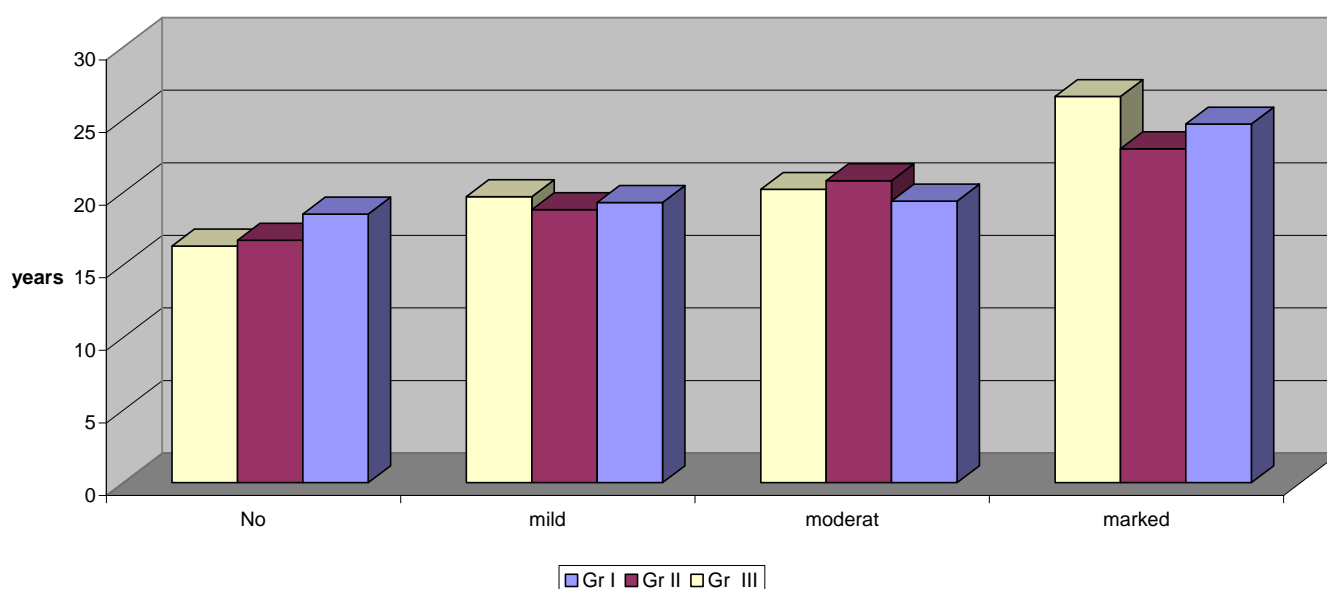

Chart (3) The relation between marked improvement among the 3 studied groups according to skin phototype

Table 9 : The relation between the improvement % and means ($\bar{x}$) ± standard deviations (SD) of ages among the 3 studied groups :

Age / Improvement %	Group I		Group II		Group III	
	No.	$\bar{x} \pm SD$	No.	$\bar{x} \pm SD$	No.	$\bar{x} \pm SD$
No improvement	2	18.5 ± 0.7	3	16.7 ± 0.6	3	16.3 ± 1.2
Mild improvement	4	19.3 ± 1.5	9	18.8 ± 1.8	3	19.7 ± 0.6
Moderate improvement	8	19.4 ± 2.9	4	20.8 ± 2.2	6	20.2 ± 2.1
Marked improvement	6	24.7 ± 7.4	4	23 ± 2.2	8	26.6 ± 3.1
Test of significance	F test = 1.99		F test = 8.075		F test = 17.6	
P value	> 0.05		< 0.001		< 0.001	
Significance	NS		HS		HS	

The relation between the improvement % and ages of patients was statistically highly significant among groups II and III.

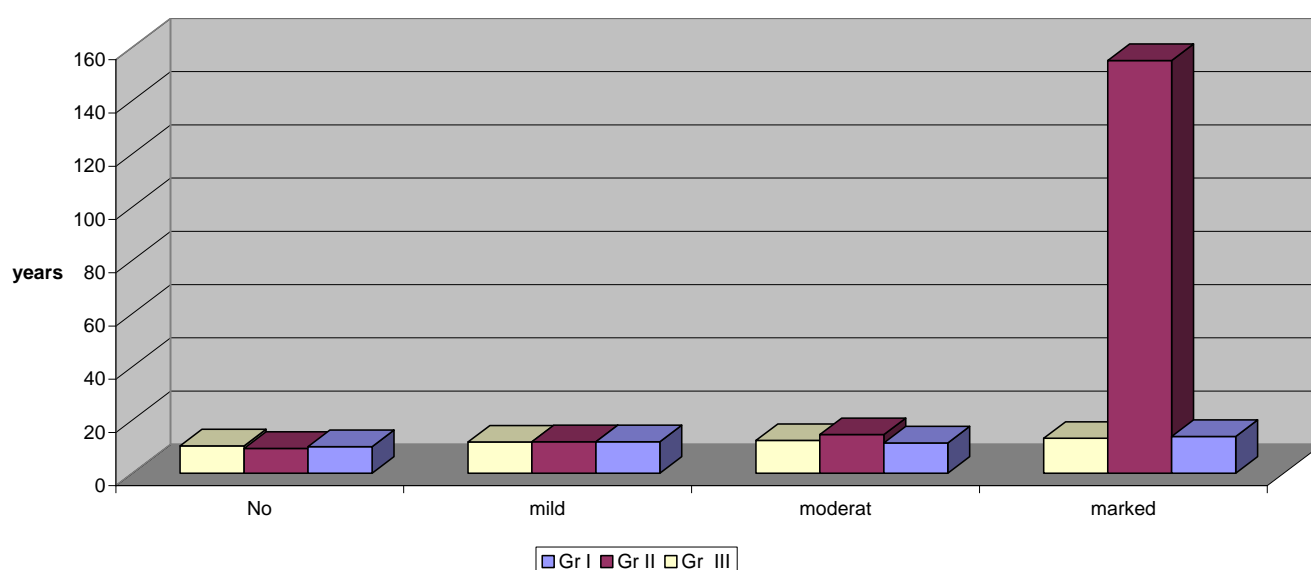Chart (4) The relation between the improvement % and means of ages among the 3 studied groups

Table 10 : The relation between the improvement % and means ($\bar{x}$) ± standard deviations (SD) of ages of onset of freckles among the 3 studied groups :

Age of onset \ Improvement %	Group I No.	Group I $\bar{x} \pm$ SD	Group II No.	Group II $\bar{x} \pm$ SD	Group III No.	Group III $\bar{x} \pm$ SD
No improvement	2	10 ± 0	3	9.3±0.6	3	10.3±0.6
Mild improvement	4	11.8 ± 1.3	9	11.8±1.4	3	11.7 ± 2.1
Moderate improvement	8	11.4 ± 1.4	4	14.5 ± 1.5	6	12.3 ± 1.4
Marked improvement	6	13.8 ± 2.1	4	15.5 ± 1	8	13.1 ± 1.9
Test of significance	F test = 4.05		F test = 18.93		F test = 2.132	
P value	< 0.05		< 0.001		> 0.05	
Significance	S		HS		NS	

The relation between the improvement % and the age of onset of freckles was statistically significant among group I, highly significant among group II, and non significant among group III.
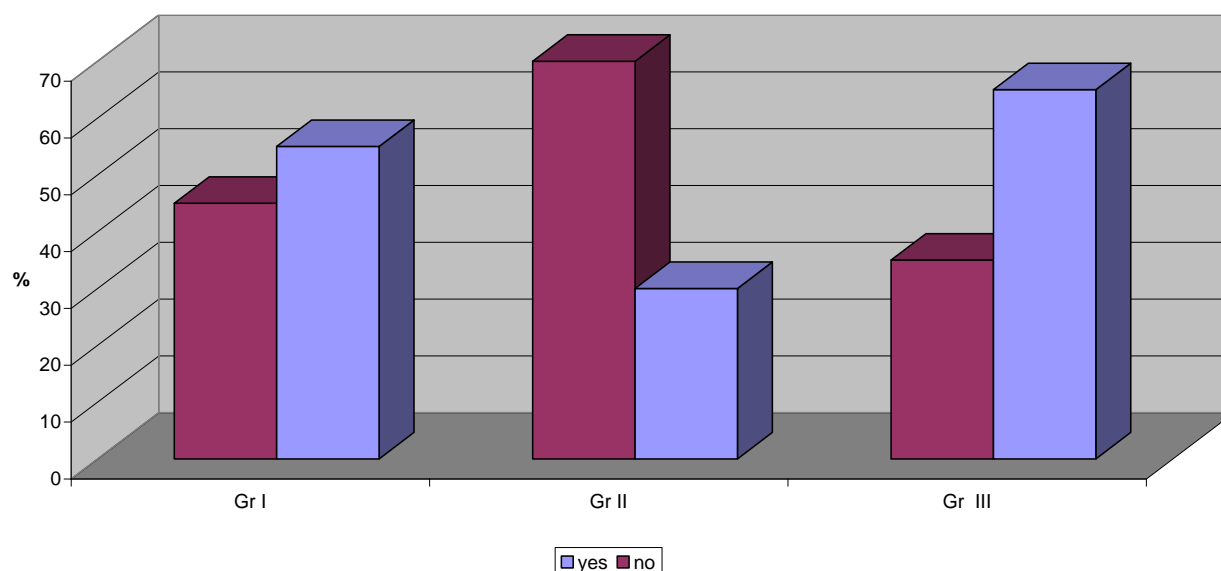

Chart (5) The relation between the improvement % and means of ages of onset of freckles among the 3 studied groups

Table 11 : The relation between the 3 studied groups as regard the recurrence rate.

Group ╲ Recurrence	Group I		Group II		Group III		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	11	55.0	6	30.0	13	65.0	30	50.0
No	9	45.0	14	70.0	7	35.0	30	50.0
Total	20	100.0	20	100.0	20	100.0	60	100.0
Chi square(x^2)	5.2							
P value	> 0.05							
Significance	NS							

The relation between the recurrence rate among the 3 studied groups was statistically non significant.
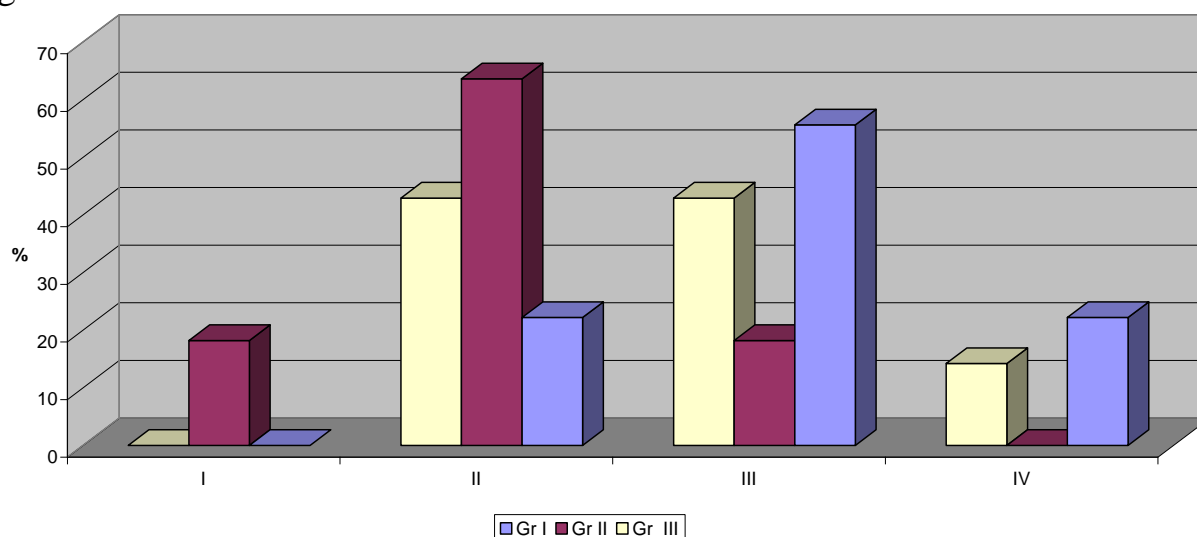

Chart (6) The relation between the 3 studied groups as regard the recurrence rate

Table 12 : The relation between the recurrence rate and skin phototype among the 3 studied groups.

Recurrence / Skin phototype	Group I				Group II				Group III			
	No		Yes		No		Yes		No		Yes	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
I	0	0.0	2	18.2	1	7.1	3	50.0	0	0.0	2	15.4
II	2	22.2	٧	٦٣.٦	5	35.7	2	33.3	3	42.9	7	53.8
III	5	55.6	2	18.2	6	42.9	1	16.7	3	42.9	4	30.8
IV	2	22.2	0	0.0	2	14.3	0	0.0	1	14.2	0	0.0
Total	9	100.0	11	100.0	14	100.0	6	100.0	7	100.0	13	100.0
Test of significance Chi square(x^2)	7.94				5.544				3.23			
P value	< 0.05				>0.05				> 0.05			
Significance	S				NS				NS			

The relation between the recurrence rate and skin phototype among group I was statistically significant, while among groups II and III it was statistically non significant.
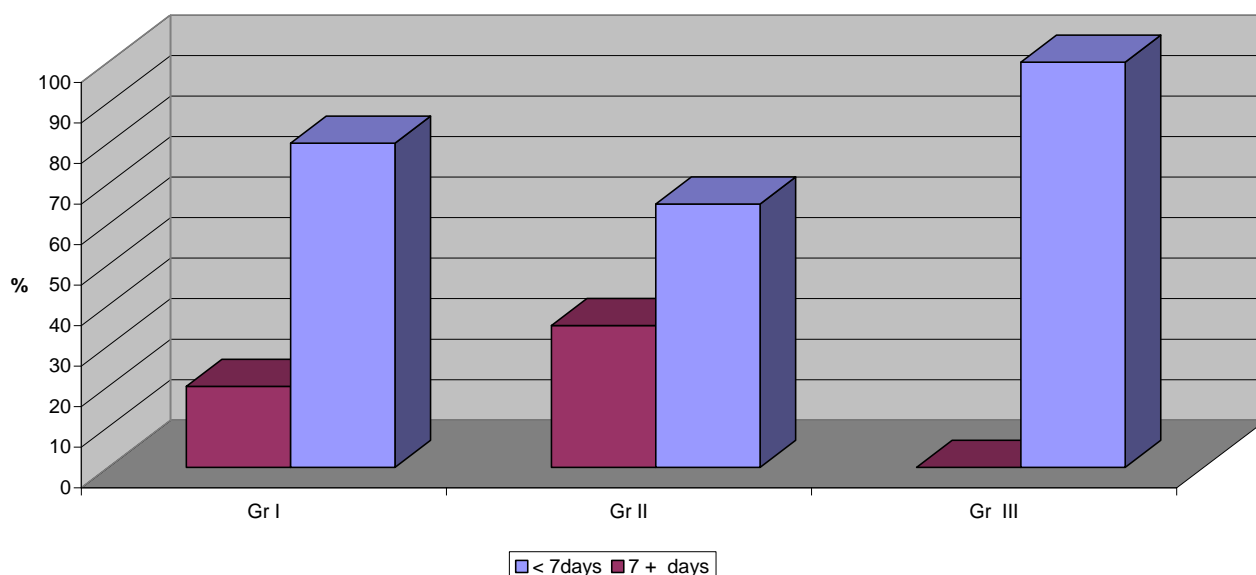

Chart (7) The relation between the recurrence rate and skin phototype among the 3 studied groups

Table 13 : The relation between the 3 studied groups as regard the speed of healing of lesions.

Group　Healing	Group I		Group II		Group III		Total	
	No.	%	No.	%	No.	%	No.	%
Less than 7 days	16	80.0	13	65.0	20	100.0	49	81.7
More than 7 days	4	20.0	7	35.0	0	0.0	11	18.3
Total	20	100.0	20	100.0	20	100.0	60	100.0
Chi square(x^2)	8.24							
P value	< 0.001							
Significance	HS							

The relation between the speed of healing of lesions among the studied groups was statistically highly significant.

Chart (8) speed of healing of lesions among the studied groups

Table 14 : The reported side effects among the 3 studied groups.

Group / SE	Group I		Group II		Group III		Total	
	No.	%	No.	%	No.	%	No.	%
PIH	2	10.0	2	10.0	0	0.0	4	6.7
Erythema	6	30.0	20	100.0	20	100.0	46	76.7
Brownish crusts	20	100.0	20	100.0	0	0.0	40	66.7