Comparative Study

Comparative Efficacy and Tolerability of Microcyn Superoxidized Solution (Oxum) against Povidone Iodine Application in Orodental Infections

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Introduction

Infections of the teeth have plagued humans constantly, despite a quest for better oral hygiene. Infections usually arise from pulpitis and associated necrotic dental pulp that initially begins on the tooth's surface as dental caries[1]. The infection may remain localized or quickly spread through various fascial planes. Dental infection can be a serious complication for patients, especially those without adequate dental or medical care. Dental infections involving the teeth or associated tissues are caused by oral pathogens that are predominantly anaerobic and usually more than one species. These infections can be of dental origin or non-odontogenic source. Those of dental origin usually originate from progressive dental caries or extensive periodontal disease. Pathogens can also be introduced deeper into the oral tissues by trauma caused by dental procedures such as the contamination of dental surgical sites and needle tracks during the local anaesthetic administration. Treatment consists of removal of the source of infection, systemic antibiotic and area drainage[2].

Incision and drainage of dental infections is often the most important surgical procedure that a patient can have.

If infection is present in the orodental area, standard treatment includes cleansing and either surgical or mechanical debridement and sometimes oral or systemic antibiotics.

An ideal oral infection care product in addition to controlling the infection should also protect the normal tissues and not interfere with the normal wound healing.

Povidone iodine is the most commonly used wound care product in practice. Although effective in killing a wide range of bacteria and viruses, it tends to kill human cells, destroying tissue and interfering with the wound healing process.

Microcyn (a Superoxidized, non toxic, non-irrigating, no rinse dermal wound irrigant) solution is used in humans for wound care treatment including postoperative (postsurgical) wound care.

Microcyn Superoxidized solution (Oxum) is a super-oxidized solution with neutral pH and a longer shelf life (>12 months) than any other Superoxidized solution so far tested.

The known chemical species present are: hypochlorous acid, sodium hypochlorite, chlorine dioxide, ozone, hydrogen peroxide, sodium hydroxide, sodium chloride. Microcyn Superoxidized solution is a hypotonic solution with an osmolarity of 13 mOsm/Kg.

It tastes better than chlorhexidine and does not stain the teeth. Some patients experience a slight burning sensation on the tongue when gargling. They should be instructed to spit out the solution. The burning then dissipates.

Microcyn solution is ready for use with no mixing or dilution required. It can be used as comprehensive therapy, as a moistening, irrigation, and debridement solution. It should be applied directly to the affected area by immersion, pouring, pressure jetting or via saturated gauze or dressing, as follows: Immerse up to 15 minutes, daily, during initial treatment soak/spray at each dressing change, as and when required.

It should be stored in its original sealed container at ambient conditions. It is non-flammable. Special storage precautions are not needed[13].

Several studies have reported excellent efficacy and safety of Microcyn in wound care. Microcyn induces wound healing by reducing the microbial load in wounds. It acts on a range of microorganisms like bacteria, viruses and fungi. Results from pilot clinical studies suggest that wounds treated with Microcyn Superoxidized solution develop granulation tissues earlier in comparison to lesions treated with other products.

Objective

The present post-marketing (user experience) study was conducted to compare the efficacy and tolerability of Oxum (Microcyn Superoxidized solution) with Povidone iodine application in the management orodental procedures.

Material and Method

Sample Size

The study was conducted in a total of 41 patients with 21 patients in Povidone iodine Group viz. Group A and 20 patients in Oxum Group viz. Group B.

Investigational Product

Test Product: Oxum

Reference Product: Povidone Iodine application

Procedures

Chief orodental complaints were assessed and the required procedures were performed in patients with such complaints. Orodental procedures were managed with Povidone iodine application in Group A and with Oxum (Microcyn Superoxidized solution) in Group B. The efficacy evaluation was based on evaluation of symptoms such as pain, swelling and redness in the area where orodental procedures have been performed.

Global efficacy and tolerability was evaluated by investigator as well as patients. Adverse events were reported in the appropriate sections of the CRF. The collected data was analyzed and interpreted using appropriate statistical tests.

Results

The study was conducted in 41 patients {21 patients in Povidone Iodine Group (Group A) and 20 patients in Oxum Group (Group B)}. The demographic characteristics of the two Groups are as given in **Table 1**.

Table 1
Demographic data of the patients enrolled

	Povidone Iodine (n=21)	Oxum (n=20)	'p'
Age (yrs.)*	42.48 (9.15)	42.20 (9.06)	0.923
Male : Female #	13:8 (61.9:38.1)	13:7 (65.0:35.0)	>0.05
Smoking #	10 (47.6%)	9 (47.4%)	>0.05
Alcohol #	2 (9.5%)	3 (15%)	
Diabetes #	1(4.8%)	2 (10%)	

* Mean (S.D.), # No. (%)

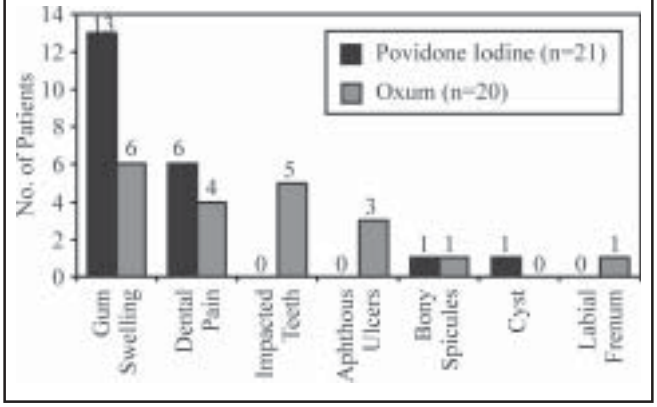
The average age of patients in Group A was 42.48+ 9.15 whereas the corresponding age in Group B was 42.20+9.06. There were 13 males each in Group A and Group B whereas there were 8 females in Group A and 7 females in Group B. In Group A, 10 patients (47.6%) were smokers whereas 9 patients (47.4%) in Group B were smokers. Overall, 2 (9.5%) patients in Group A were alcoholic and 3 patients (15%) in Group B were alcoholic. One patient in Group A and 2 patients in Group B had a history of diabetes.

Table 2, Graph 1 reveal the chief complaints of the enrolled patients. As shown in the **Table 2**, 13 (61.9%) patients in Group A and 6 (30%) patients in Group B had

Table 2
Chief Complaints of the patients enrolled

	Povidone Iodine (n=21)	Oxum (n=20)	'p'
Gum Swelling	13 (61.9%)	6 (30.0%)	0.044
Dental Pain	6 (28.6%)	4 (20.0%)	
Impacted Teeth	0 (0%)	5 (25.0%)	
Aphthous Ulcers	0 (.0%)	3 (15.0%)	
Bony Spicules	1 (4.8%)	1 (5.0%)	
Cyst	1 (4.8%)	0 (.0%)	
Labial Frenum	0 (.0%)	1 (5.0%)	

Graph 1
Chief Complaints of the patients enrolled



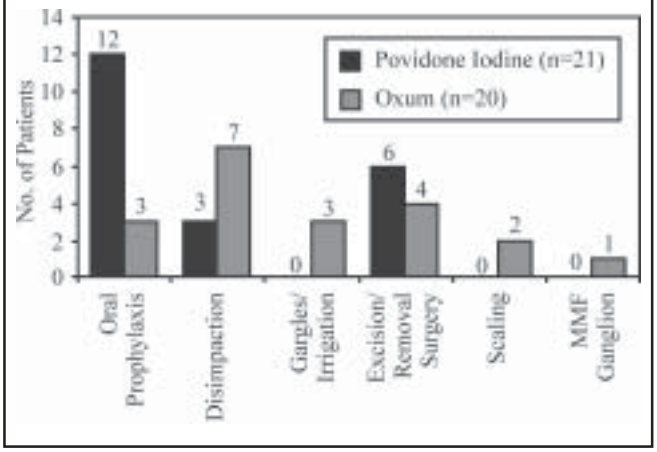
Swelling of gums. 6 (28.6%) patients in Group A had a dental pain and 4 (20%) patients in Group B had dental pain. None of the patients in Group A but 5 (25%) patients in Group B had impacted teeth. None of the patients in Group A but 3 (15%) patients in Group B had aphthous ulcers. One patient in each Group has bony spicules whereas one patient (4.8%) in Group A and none of the patients in Group B had cyst. None of the patients in Group A and one patient (5%) in Group B had labial frenum.

Table 3 shows the details of procedures done on enrolled patients for their chief complaints. Oral prophylaxis was performed in 12 (57.1%) in Group A and 3 (15%) in Group B. Disimpaction was performed in 3 (14.3%) and 7 (35%) patients in Group A and in Group B respectively. Irrigation or gargle was done in 3(15%) patients in Group B. Excision

Table 3
Procedure done on the patients enrolled

	Povidone Iodine (n=21)	Oxum (n=20)	'p'
Oral Prophylaxis	12 (57.1%)	3 (15.0%)	0.020
Disimpaction	3 (14.3%)	7 (35.0%)	
Gargles/Irrigation	0 (.0%)	3 (15.0%)	
Excision/Removal Surgery	6 (28.6%)	4 (20.0%)	
Scaling	0 (.0%)	2 (10.0%)	
MMF Ganglion	0 (.0%)	1 (5.0%)	

Graph 2
Procedure done on the patients enrolled



or removal surgery was performed in 6 (28.6%) patients and 4 (20%) patients in Group A and Group B respectively. Scaling was performed in 2 (10%) patients in Group B. MMF ganglion was performed in 1 (5%) patients in Group B.

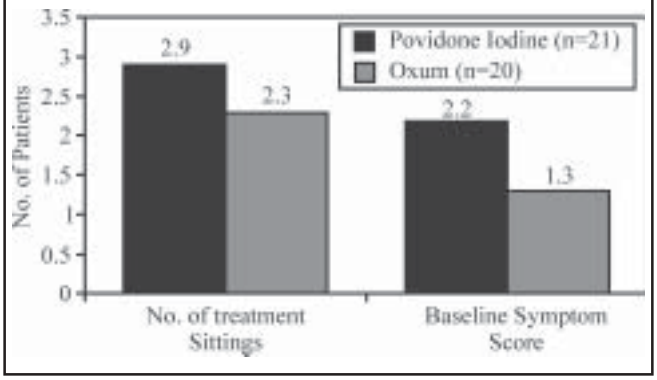
Table 4, Graph 3 reveal the no. of treatment sittings and baseline symptom scores of patients enrolled in the study. Overall 2.9 ± 0.5 sittings were required for patients in Group A and 2.3 ± 1.3 sittings were required for patients in Group B. Baseline symptom score was 2.2 ± 0.6 and 1.3 ± 0.8 for patients in Group A and Group B respectively.

The mean pain scores of patients in both the Groups are mentioned in **Table 5**. The mean pain score of patients in Group A on Day 1 was 2.5 ± 0.6. The mean pain score was reduced to 2.1 ± 0.5 on day 3 and was further reduced to 1.9

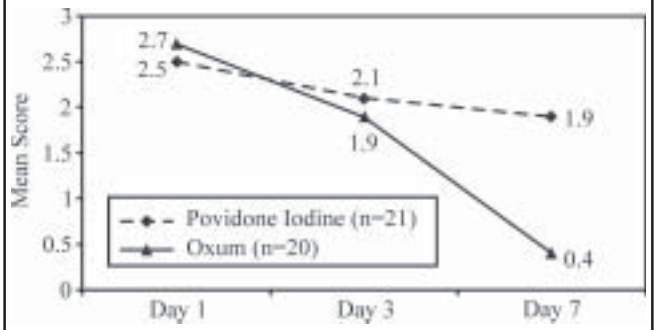
Table 4
No of treatment sittings & baseline symptom score of the patients enrolled in the study

	Povidone Iodine (n=21)		Oxum (n=20)		
	Mean	S.D.	Mean	S.D.	'p'
No. of treatment Sittings	2.9	0.5	2.3	1.3	0.083
Baseline Symptom Score	2.2	0.6	1.3	0.8	0.012

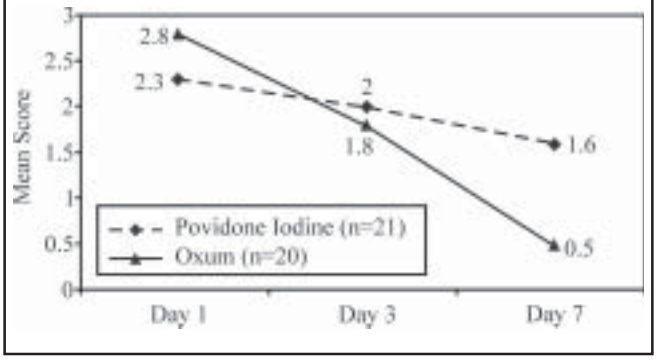
Graph 3
Mean no. of sittings & Baseline symptom score



Graph 4
Mean Score for PAIN



Graph 5
Mean Score for SWELLING



± 0.6 on day 7. Mean pain scores of patients in Group B on day 1 was 2.7 ± 0.5 which was reduced to 1.9 ± 0.8 on day 3 and was further reduced significantly to 0.4 ± 0.8 on day 7.

Table 5
Pain Score in the patients

	Povidone Iodine (n=21)		Oxum (n=20)		
	Mean	S.D.	Mean	S.D.	'p'
Day 1	2.5	0.6	2.7	0.5	0.238
Day 3	2.1	0.5	1.9	0.8	0.782
Day 7	1.9	0.6	0.4	0.8	<0.0001
Friedman Test, 'p' Chi-Square	<0.0001 20.15		<0.0001 22.53		

As shown in **Table 6**, swelling score in patients are as shown in **Table 6** (**graph 5**). The mean swelling score for patients in Group A on day one was 2.3 ± 0.6 which was reduced to 2.0 ± 0.5 on day 3 and was further reduced to 1.6 ± 0.5 on day 7. The corresponding swelling scores for patients in Group B were 2.8 ± 0.4, 1.8 ± 0.9 and 0.5 ± 0.9 respectively.

Table 6
Swelling Score in the patients

	Povidone Iodine (n=21)		Oxum (n=20)		
	Mean	S.D.	Mean	S.D.	'p'
Day 1	2.3	0.6	2.8	0.4	0.019
Day 3	2.0	0.5	1.8	0.9	0.890
Day 7	1.6	0.5	0.5	0.9	0.001
Friedman Test, 'p' Chi-Square	<0.0001 20.829		<0.0001 19.158		

Graph 6
Mean Score for REDNESS

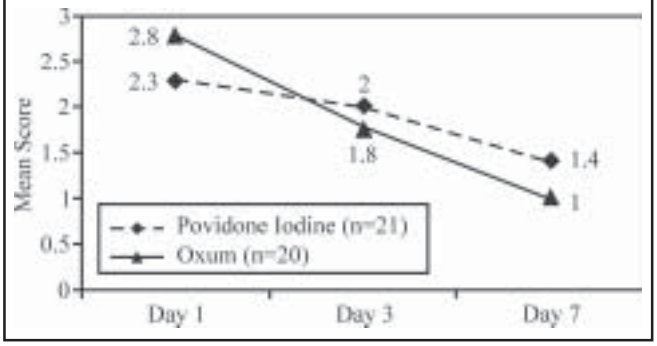
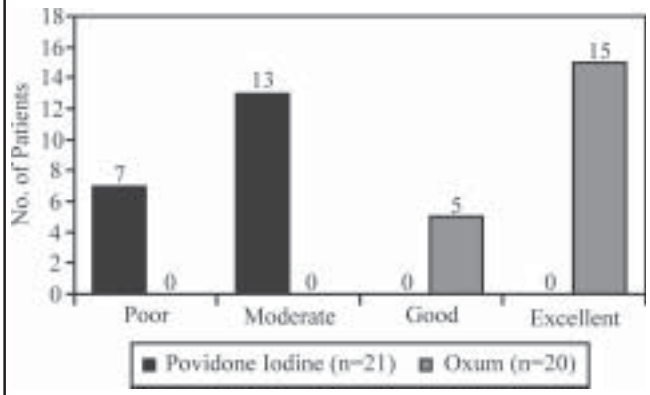


Table 7, Graph 6 demonstrate the redness score in patients in both the Groups. On day 1, the mean scores for patients in Group A was 2.3 ± 0.6 whereas on day 3 it was 2.0 ± 0.5 and it was further reduced to 1.4 ± 0.7 on day 7. The corresponding redness scores 2.8 ± 0.5, 1.8 ± 1.3 and 1.0 ± 1.2 respectively.

Table 7
Redness Score in the patients

	Povidone Iodine (n=21)		Oxum (n=20)		
	Mean	**S.D.**	**Mean**	**S.D.**	**'p'**
Day 1	2.3	0.6	2.8	0.5	0.173
Day 3	2.0	0.5	1.8	1.3	1.000
Day 7	1.4	0.7	1.0	1.2	0.502
Friedman Test, 'p' Chi-Square	<0.0001 27.208		0.037 6.615		

Graph 7
Efficacy Evaluation by Patient



Global assessment of efficacy and tolerability for both the treatments was performed by investigator and patient (**Table 8a**). Global assessment of efficacy was performed at the end of therapy by patient as well as by investigators (**Table 8b**). None of the patients in Group A reported excellent and good response to the treatment. Thirteen (65%) patients in Group A reported moderate response and 7 (35%) patients reported poor response to treatment in Group A. However, none of the patients in Group B reported poor or moderate response to the therapy, whereas 5 (25%) patients reported good response and 15 (75%) patients in Group B reported excellent response to the therapy (**Graph 7**).

Table 8a
Global Assessment of Efficacy & Tolerability at the end of therapy

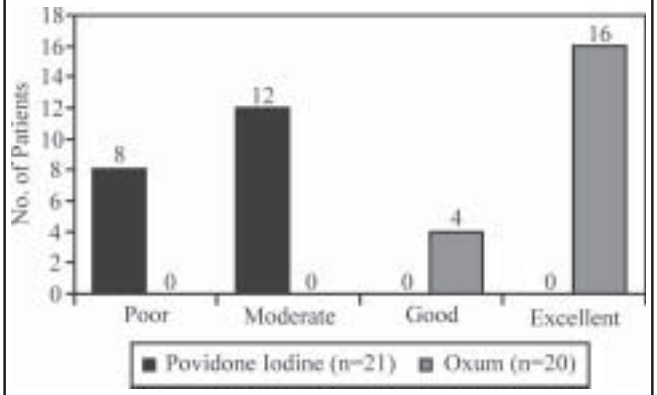
	Povidone Iodine (n=21)		Oxum (n=20)		
	Mean	S.D.	Mean	S.D.	'p'
Efficacy Evaluation					
By Patient	1.7	0.5	3.8	0.4	<0.0001
By Investigator	1.6	0.5	3.8	0.4	<0.0001
Tolerability Evaluation					
By Patient	1.7	0.5	3.7	0.5	<0.0001
By Investigator	1.7	0.5	3.6	0.5	<0.0001

Table 8b
Global Assessment of Efficacy at the end of therapy

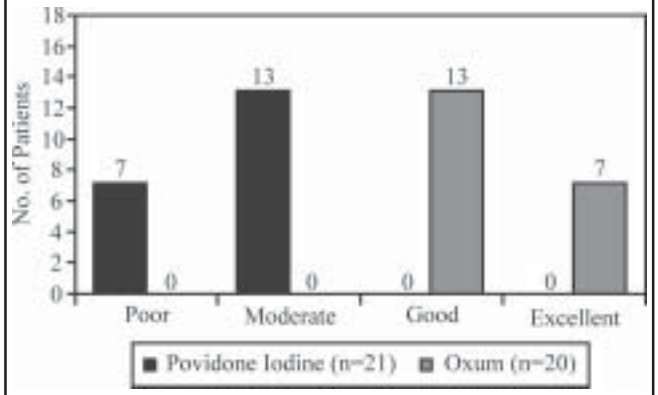
	Povidone Iodine (n=21)	Oxum (n=20)	'p'
Efficacy Evaluation by Patient			
• Poor	7 (35.0%)	0 (0.0%)	<0.0001
• Moderate	13 (65.0%)	0 (0.0%)	
• Good	0 (0.0%)	5 (25.0%)	
• Excellent	0 (0.0%)	15 (75.0%)	
Efficacy Evaluation by Investigator			
• Poor	8 (40.0%)	0 (0.0%)	<0.0001
• Moderate	12 (60.0%)	0 (0.0%)	
• Good	0 (0.0%)	4 (20.0%)	
• Excellent	0 (0.0%)	16 (80.0%)	

Similarly, investigators reported moderate and poor responses to the treatment in 12 (60%) and 8 (40%) patients in Group A respectively. Excellent to good response was reported in none of the patients in Group A. Investigators reported excellent response to the treatment in 4 (20%) patients and good response in 16 (80%) patients in Group

Graph 8
Efficacy Evaluation by Investigator



Graph 9
Tolerability Evaluation by Patient



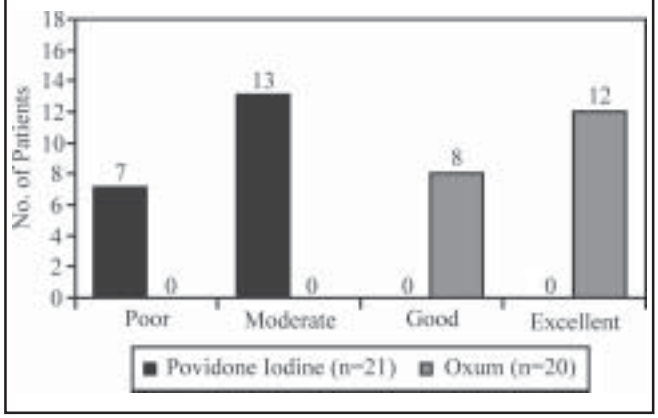
B. However, moderate to poor response was not reported in any of the patients in Group B (**Graph 8**).

Global tolerability assessment was also performed by patients as well as investigators (**Table 8c**). None of the patients in Group A reported good to excellent tolerability, however, in Group B, 13 (65%) patients reported good and 7 (35%) patients reported excellent tolerability to the treatment. None of the patients in Group B reported poor or moderate tolerability to the treatment. But 7 (35%) and 13 (65%) patients in Group A reported poor and moderate tolerability respectively to the treatment (**Graph 9**).

Table 8c
Global Assessment of Tolerability at the end of therapy

	Povidone Iodine (n=21)	Oxum (n=20)	'p'
Tolerability Evaluation by Patient			
• Poor	7 (35.0%)	0 (0.0%)	<0.0001
• Moderate	13 (65.0%)	0 (0.0%)	
• Good	0 (0.0%)	13 (65.0%)	
• Excellent	0 (0.0%)	7 (35.0%)	
Tolerability Evaluation by Investigator			
• Poor	7 (35.0%)	0 (0.0%)	<0.0001
• Moderate	13 (65.0%)	0 (0.0%)	
• Good	0 (0.0%)	8 (40.0%)	
• Excellent	0 (0.0%)	12 (60.0%)	

Graph 10
Tolerability Evaluation by Investigator



Tolerability evaluation by investigator also shows a similar response in patients in Group A. In Group B, investigators reported excellent and good response in 8 (40%) and 12 (60%) patients respectively (**Graph 10**).

Discussion

Dental infections are becoming more and more serious with each passing year. Oral bacteria are beginning to develop resistant strains that do not respond to a routine dental antibiotic.

Microcyn Superoxidized solution has been found to be useful in dental applications. For confirming the efficacy

of Microcyn Superoxidized solution in dental infections, over 200 patients with root canal infections were treated with Microcyn Superoxidized solution (109 pts) or diluted hypochloride (129 pts). Only 2 patients had an acute local reaction after the root canal treatment with (Microcyn Superoxidized solution whereas 16 patients did it with hypochloride. Total number of affected teeth in (Microcyn Superoxidized solution) (2) versus hypochloride (23). Dental losses occurred in the hypochloride Group only and none in the study Group, after the successful re-treatment with (Microcyn Superoxidized solution)[3].

In this post-marketing study, Oxum was tested against Povidone iodine for efficacy and tolerability in the management of orodental infection.

A total of 41 patients who had dental complaints involving infections were enrolled in this parallel-study. They were divided into two Groups viz. Group A and Group B. Patients in Group A (21) received Povidone iodine whereas those in Group B (20 patients) received Oxum. As seen from the results, both the Groups were similar and there was no significant difference between the two Groups in terms of demographic characters and medical history. The gender distribution in both the Groups was matching and there was no significant difference between the two Groups. Only 1 patient in Group A and 2 in Group B had diabetes.

Patients in both the Groups had more or less similar orodental complaints which included swelling of gum, dental pain, impacted teeth, aphthous ulcers, bony spicules, cyst and labial frenum. All these complaints were indicative of infection or potential infection and therefore needed surgical/ non-surgical prophylaxis or treatment including oral prophylaxis, disimpaction, irrigation, surgical removal of tooth/teeth, scaling, MMF ganglion etc. All these procedures were performed in required number of sittings which ranged from 2-4 sittings. The baseline scores of symptoms viz. pain, swelling and redness were recorded. Patients were followed up on day 3 and day 7.

It is evident from the results that patients in Group B had significantly greater reduction in pain scores compared to baseline on day 3 and day 7 than patients in Group A. Similarly, other symptoms showed the same trend in both the Groups.

As evident from the global efficacy assessment results, patients receiving Oxum treatment reported excellent to good efficacy whereas those receiving Povidone iodine treatment reported moderate to poor efficacy of the treatment. Similar results were also reported by the investigators.

Tolerability assessment indicated that Oxum has better tolerability profile as compared to Povidone iodine.

Overall, the results of the study strongly suggest the superiority of Oxum to Povidone iodine in the treatment or prophylaxis of orodental infections. The study thus confirms superior efficacy and tolerability profile of Oxum over Povidone iodine.

No studies have been reported so far with the use of Oxum in comparison with Povidone iodine in orodental infections.

However, the findings of this study are supported by the findings of Dalla Poala[4] *et al* in a comparative study of Microcyn Superoxidized solution against Povidone iodine in the management of diabetic foot ulcer.

Wolvos TA[5] used Microcyn Superoxidized solution to treat 26 patients with various wound types that included 9 patients with post-operative wound. In these patients, the wounds including those with complications healed completely with dressings of wound with Microcyn Superoxidized solution.

He concluded that Microcyn Superoxidized solution could be used to treat a variety of wounds from simple to extremely complex. It can be used as the wound irrigation solution at simple dressing changes, and it can serve as the solution with which to moisten the gauze used to dress the wound.

Gutierrez AA[6] in his study to explore various applications of Microcyn Superoxidized solution concluded that the moistening effect and the minimum toxicity found with the use of this super-oxidized solution makes it a good choice for wound care management and that this non-antibiotic technology appears to offer a broad new paradigm for the prevention and treatment of acute and chronic wounds.

Martinez F,[7] had mentioned that Microcyn Superoxidized solutions could certainly have an impact on wounds including dental infections. Several physicians and other health professionals have been interested in assessing Microcyn in orodental infections. Results of this study therefore prove the efficacy and safety of Microcyn Superoxidized solution in orodental infections.

Conclusion

Oxum (Microcyn Superoxidized solution) is safe and effective for prophylaxis and treatment of orodental infections and offers better efficacy and safety response as compared to Povidone iodine application.

References

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