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## Role of povidone iodine (PVP-I) in surgical extraction of impacted lower third molars: Hemostyptic and anti-edema?

**Mohammed Sabe-Alarab, Hussein AL-Essa, Fawaz Jaber and Hussam Saleh**

### Abstract

**Purpose:** The aim of this prospective study is to investigate the role of povidone iodine in reducing hemostyptic and edema in surgical extraction of impacted lower third molars.

**Materials and Methods:** The study was carried out on 40 impacted lower third molars of 20 patients (8 males + 12 females) their ages ranged between (18-33 years). These patients had two symmetric impacted lower third molars. The samples were categorized into two groups, the normal saline was used as an irrigant solution in the first group and the (PVP-I) solution was used in the second group. The edema and pain were observed after one, two and seven days. The bleeding was estimated after 24 and 48 hours. After that the data was examined using SPSS statistic program. P values lower than 0.05 were considered statistically significant.

**Results:** There was a difference in the edema ( $P < 0.05$ ) between the two used solutions throughout the first and second day after surgical procedure. However, there was no significant difference in the edema between the two used solutions on day 7 post-surgery. The bleeding and pain were at the same level between the two used solutions over all observations periods.

**Conclusions:** Povidone-iodine efficiency, which was used for surgical extractions of the lower third molars impacted on edema, was only noticed throughout the first few days followed surgical procedure. Its efficiency on bleeding was the same in comparison with normal serum used for the same purpose. For this reason povidone-iodine was preferred to use for irrigation rather than the normal serum in case of surgical extractions of lower third impacted molars.

**Keywords:** Povidone-iodine, normal serum, surgical extractions, edema, bleeding, lower third molars impacted

### Introduction

Iodine element was discovered in 1811. It is a dark violet solid that dissolves in alcohol and potassium iodide. Its first reported use in treating wounds was by Davies in 1839<sup>[1]</sup>, and later it was used in the American Civil War. Early products caused pain, irritation and skin discoloration, but the development of iodophores (povidone iodine and cadexomer iodine) since 1949 yielded safer and, less painful formulations<sup>[2]</sup>.

(PVP-I) is a widely used and highly potent antiseptic, discovered by Shelanski and Shelanski in 1956, which formed by binding free iodine to polyvinyl-pyrrolidone (PVP). This is done to decrease the toxicity of the iodine<sup>[3]</sup>.

(Polyphenyl pyrrolydine) is an iodine molecule with the Iodophor carrier characterized by high antimicrobial activity, low strength of resistance development, and low cost<sup>4</sup>. The use of (PVP-I) for irrigation is simple, inexpensive and it has a potential capacity to reduce the sepsis in the surgical work areas<sup>[4]</sup>.

The potential antiseptic of PVP-I is due to its toxicity towards microorganisms because it combines irreversibly with tyrosine residues of proteins, interferes with the formation of hydrogen bonding by some amino acids and nucleic acids, oxidizes sulfhydryl groups and reacts with sites of unsaturation in lipids<sup>[5]</sup>.

In oral surgery, PVP-I is used as an irrigant of the alveolar sockets following dental extractions. In KUMAR BP *et al.*<sup>[4]</sup> study, The authors found by chance that irrigation of extraction sockets with povidone-iodine led to cessation of bleeding in patients without

recurrence. Fifty patients were selected and divided equally into treatment and control groups. Povidone-iodine (1%, w/v) was used for irrigation of extraction sockets in the treatment group and saline was used in the control group. In the treatment group, 19 patients showed cessation of bleeding compared to only 5 in the control group. Povidone-iodine significantly ( $P < 0.01$ ) controlled bleeding as compared to saline [4].

In KUMAR K *et al.* [6] prospective pilot study, they used PVP-I (0.5%) as an irrigant of the periapical lesions in single rooted maxillary anterior tooth of 1-2 cm in diameter. The result showed a statistically significant reduction in the time required to achieve a bloodless field and a marked decrease in oedema in the first and second postoperative days resulting in lesser consumption of NSAIDs [6].

There are no previous studies in literature dealing with the use of povidoneiodine as a irrigant in the bone removal in surgical extraction of the lower third molars. The aim of this study is to investigate the role of povidone iodine as a irrigant in the surgical extraction of the lower third molars in reducing edema and bleeding and comparing it with the serum.

**Materials and Methods**

This study was conducted in the period between June 2013 and December 2014. This study was carried out on 40 impacted lower third molars of 20 patients (8 males + 12 females) who had two symmetric impacted lower third molars who needed surgical dental extractions. The samples were categorized into two groups, the normal saline was used as an irrigant solution in the first group and the (PVP-I) solution was used in the second group. A written consent was taken from the patients before conducting the study. Inclusion and exclusion criteria for the patients are listed in Table 1.

**Table 1:** Criteria for patient selection

Inclusion criteria
Age between 17 and 42 years.
No history of bleeding disorders
No history of eventful previous extraction
No pain or infection at the surgical site
Exclusion criteria
Patients on anti-coagulant therapy
History of hypersensitivity to iodine
Long-term NSAID therapy

A total of 2 ml of 2% Lidocaine with Epinephrine (1:80000) was given during the surgery. Block anesthesia was performed of the inferior alveolar nerve by direct method and complementary anesthesia of the buccal nerve. The mucoperiosteum flap was done to all surgical extraction (figure 1).



**Fig 1:** mucoperiosteum flap

Cutting bone was made by round surgical burs. The PVP-Isolution (0.5 mg/ml) was used as an irrigant solution during the surgical extraction (figure 2).



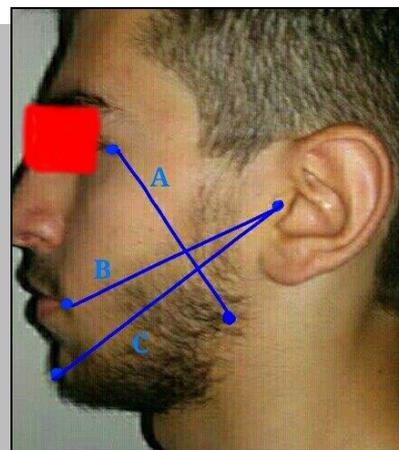
**Fig 2:** (PVP-I) and removal bone

In the rest of case. Saline (sodium chloride 0.9% was used to irrigate the bone during bone removal (figure 3).



**Fig 3:** saline and removal bone

Same type suture material was used for all cases (0/3 silk braided). Same surgeon performed all surgeries as a day care surgery in the morning between 9.00 am to 11.00 am. Patient was prescribed with 500 mg of amoxicillin Cap Qid daily for 5 postoperative days, ibuprofen 600 mg F.C. Tab Tid daily was prescribed for 2 days and extended as required. The edema was observed after one, two and seven days. The reference points which used to measure edema were determined by (figure 4 ).



**Fig 3:** reference points which used to measure edema

- A. Distance from the angle of the lateral eye to the mandible angle
- B. Distance from the tragus to the Labial commissure
- C. Distance from the tragusto the point (po) of the skin

The patient's perception of pain on a visual analog scale were observed after one, two and seven days. Haemostasis was examined visually by oozing following surgical operation from 30 minutes to 7 days, depending on the VAS scale.

**Results**

A total of 20 patients requiring surgical removal of bilaterally impacted mandibular third molars were included in the present study of whom 8 were males and 12 females with a mean age of 25 years (range 18-33 years). The results of the study were evaluated statistically using SPSS Software.

There was a difference in the edema ( $P < 0.05$ ) between the two used solutions over the first and second day postoperative. While there was no significant difference in the edema ( $P > 0.05$ ) between the two used solutions on day 7 post-surgery (table 2).

There was no significant difference in the pain ( $P > 0.05$ ) between the two used solutions throughout all observation periods (table 3).

There was no significant difference in the oozing ( $P > 0.05$ ) between the two used solutions throughout all observation periods. (table 4 + 5)

**Table 2:** Comparison of facial measurements experienced by study groups student test was carried out for evaluation of swelling

P value	T value	Max	Min	Std. Error	Std. Deviation	mean	N			
0.001	-0.047	13	0	0.825	3.691	6.050	20	normal saline	1st day	facial measurements
		11	2	0.672	2.007	4.1	20	Povidone Iodine (PVP-I)		
0.002	-0.55	15	2	0.946	4.233	9.870	20	normal saline	2nd day	
		14	2	0.681	2.940	5.3	20	Povidone Iodine (PVP-I)		
0.773	0.291	7	0	0.488	2.186	1.600	20	normal saline	7th day	
		7	0	0.484	2.166	1.800	20	Povidone Iodine (PVP-I)		

**Table 3:** Comparison of pain score (VAS) experienced by study groups Wilcoxon Signed Ranks test was carried out for evaluation of pain

P value	(Z) value	Wilcoxon Value W	Mann-Whitney U	Max	Min	Std. Error	Std. Deviation	N			
0.824	-0.222	402.000	192.000	6	1	1.503	2.950	20	normal saline	1st day	The Pain
				5	1	1.356	2.950	20	Povidone Iodine (PVP-I)		
0.243	-1.166	371.000	161.000	2	0	0.686	0.950	20	normal saline	2nd day	
				2	0	0.656	0.700	20	Povidone Iodine (PVP-I)		
0.485	-0.698	394.000	184.000	1	0	0.410	0.200	20	normal saline	7th day	
				2	0	0.615	0.200	20	Povidone Iodine (PVP-I)		

**Table 4:** Results of monitoring the duration of oozing stop in the study sample according to the study group

total	Percent (%)		total	N		
	Oosing stopped after 48 h	Oosing stopped after 24 h		Oosing stopped after 48 h	Oosing stopped after 24 h	
100	15	85	20	3	17	normal saline
100	0	100	20	0	20	Povidone Iodine (PVP-I)

**Table 5:** Chi-squared test results for the study the significance of bilateral differences

P value	FD	Chi-squared value	N	
100	19	0	20	normal saline
85	19	1	20	Povidone Iodine (PVP-I)

**Discussion**

There is a very limited amount of literature on the effect of povidone iodine (PVP-I) on pain, swelling and oozing in third molar surgery.

This study was designed to evaluate the efficacy of normal saline and povidone iodine as irrigating solutions on impacted mandibular third molar surgery. An ideal irrigating solution for surgical removal of wisdom tooth should be easily available or prepared, isotonic, nonirritant, nontoxic, non hemolytic, antiseptic, and yet economical [7].

Povidone -iodine (Betadine) is an antiseptic solution consisting of polyvinylpyrrolidone with water, iodide and 1% available iodine; it has bactericidal ability against a large array of pathogens [8].

Povidone iodine is a soluble complex of iodine which releases free iodine slowly. It acts by iodinating and oxidizing the microbial protoplasm.

Iodine is a quickly acting, broad-spectrum microbial agent active against bacteria, fungi, and viruses. When 1% povidone iodine is used as an irrigant in minor oral surgical procedure preoperatively, it is effective in reducing the oral cavity bacterial counts up to 1 hour of the surgical procedures without local postoperative complications [9].

Normal saline is isotonic and had physiologic properties similar to the natural tissue fluid. It is the most commonly used irrigating solution for the surgical removal of impacted third molars. During the surgical removal of impacted third molar, normal saline is most commonly used for irrigation and it is recommended as the best cleansing solution for human body wound [10-11].

In study conducted by Koerner 1994, it is found that sterile water and normal saline can be used as the irrigating solution during surgical removal of wisdom tooth [12].

In this study 0.5% povidone iodine was found more effective than normal saline in control of postoperative swelling during the first and second day after surgery ( $P < 0.05$ ). While there was no significant difference in the swelling ( $P > 0.05$ ) between the two materials on day 7 post-surgery.

Kumar k, 2011 pointed out that the povidone ability with low concentration in edema reduction due to inhibition of LTB4 leukotriene production which is largely responsible for edema and chemical attraction [6].

LTB4 contribute in the inflammatory process by increasing pain, vasodilation, increasing plasma hemorrhage and chemical attraction of immune cells [13].

That is explaining substantial difference in edema in the first

and the second day where there is an increase in the LTB4 concentration in the surgical incision after extraction third of impacted molar especially in the first two days <sup>[14]</sup>.

Pain and oozing control did not differ between the two agents throughout all observations periods ( $P>0.05$ ).

more such investigations with more groups may be carried out to evaluate the efficacy of these irrigating agents to reduce the postoperative morbidity.

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