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Research Article

EVALUATION OF EFFICACY OF NEW RESORBABLE DRESSING AFTER SURGICAL REMOVAL OF BILATERAL MANDIBULAR THIRD MOLAR-A SPLIT MOUTH STUDY

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A R T I C L E I N F O

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Resopac, wound healing, bilateral mandibular 3rd molar

A B S T R A C T

Objectives: The objectives of this study is to evaluate whether the resorbable dressing is effective in improving wound healing after surgical removal of mandibular third molar and to evaluate the efficacy of resorbable dressing after 3rd molar surgery.
Methods: A split mouth study was carried out in department of Oral and Maxillofacial Surgery. A total 40 patients were selected based on inclusion and exclusion criteria. Informed consent was obtained from all the patients involved in the study. Patients who will fulfil the study criteria were divided into two groups: In Group A Postoperative Reso-pac dressing was placed (every 24 hours for three days). Paste had been manipulated into a thin roll by kneading with wet gloves and applied by spreading and adapting it on to the wound surface. In Group B Gauze pack dressing was given.
Results: At day 1, 90.7% (n=39) subjects in group A showed good healing as compared to only 37.2 % (n=16) subjects in group B and this difference between two groups was significant. At day 3, 88.4% (n=38) subjects in group A showed very good healing as compared to only 23.3% (n=10) subjects in group B and this difference between two groups was significant. At day 7,97.7% (n=42) subjects in group A showed very good healing as compared to only 23.3 % (n=10) subjects in group B and this difference between two groups was significant.
Conclusion: From our study we can conclude that Reso-pac dressing is found to be effective for better wound healing, after the surgical removal of third molar.

INTRODUCTION

Wounds are one of the most frequent problems in the emergency and surgical department[1].Wound healing is a dynamic and complex process that requires a suitable environment to promote the healing process[1].Wounds of the oral mucosa usually heal rapidly despite of their adverse bacteria and trauma from local factors, such as the movement of the tongue or other oral structures during speaking or eating. Healing may be delayed in some cases if the wound becomes infected by the ambient micro-organisms of the oral cavity or if the blood clot covering the wound is disturbed by local conditions [2]. In Mandibular third molar surgery, primary closure of the mucoperiosteal flap has been associated with increased post-operative complications compared to flap repositioning and secondary healing [3].

Wound dressing is an essential part for promoting uneventful healing, whether it is a minor cut or a major incision. The dressing protects the wound from a mechanical, microbial and thermal injury [4].

Conventionally intraoral extraction wounds are closed with normal saline gauze pressure packs or by suturing[1].Now-a-days many surgeons use various dressing materials to avoid contamination at surgically sutured sites and promote wound healing. In this study we are using resorabable dressing material (Resopac)

Reso –Pac is a self-dissolving hydrophilic wound protecting dressing. It acts as a protective barrier to the wound. It gradually dissolves in saliva and does not need removal[5]. Non-adherent wound dressing for at least 24 to 48 hours has a shielding effect until enough epithelialization is present to protect the wound from gross contamination [6].

The rationale of the study is to evaluate the efficacy of new resorbable dressing in wound healing after surgical removal of bilateral mandibular third molar.

MATERIAL AND METHODS

A split mouth clinical study was conducted in the department of oral and maxillofacial surgery. The study comprised 40 patients who required removal of their mandibular third molars. The study was explained to patients and informed consent obtained for the procedure and follow up. The study was approved by the institutional ethical committee board.

Inclusion criteria

1. Patients who willing to participate in the study and give written informed consent for being part of the study.
2. Patients with mesioangular or vertical impacted bilateral Mandibular third molar indicated for removal.

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3. Patients of age between 20-40 years.

Exclusion criteria

1. Patient with gross infections, pericoronitis.
2. Patient those with a history of allergy to any drug.
3. Patients with diabetes, hypertension or any other severe systemic disease.

Subject withdrawal criteria

1. Patient who wants to withdraw from the research.
2. Patients who cannot follow up for the given period of time.

Surgical Procedure

In accordance with the protocol for preoperative antisepsis, local anaesthesia was performed by blocking the inferior alveolar and lingual, buccal nerves with a maximum of 2 doses of 2 mL of lignocaine hydrochloride (40 mg), with epinephrine (1:200,000) using a plastic disposable injection syringe. 10 minutes after anesthesia administration, a horizontal and sulcular incision was performed, and a mucoperiosteal envelope flap was elevated. The bone covering the impacted third molar tooth was removed with the use of a surgical handpiece and rotary instrument. During the operation, saline water was to protect the bone from developing a high temperature. After extraction of the third molar, the cavity was treated with curettage, lavage with saline, and sutured. (figure 1). In Group A Postoperative Reso-pac dressing was placed (figure 2- every 24 hours for three days). Paste had been manipulated into a thin roll by kneading with wet gloves and applied by spreading and adapting it on to the wound surface and in Group B Gauze pack dressing was given. Post-operative instruction was given.Post-operatively re-application of Reso-pac dressing was done on the 1st, 2nd, 3rd days.

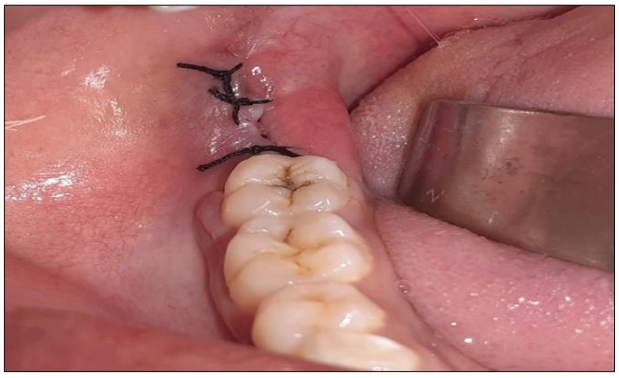


Figure 1 Surgical wound closure after 3 rd molar surgery

Follow up of patient was done postoperatively at interval of 1st, 3rd and 7th post-operative days to assess wound healing. Complications, if any were noted at every review appointment.

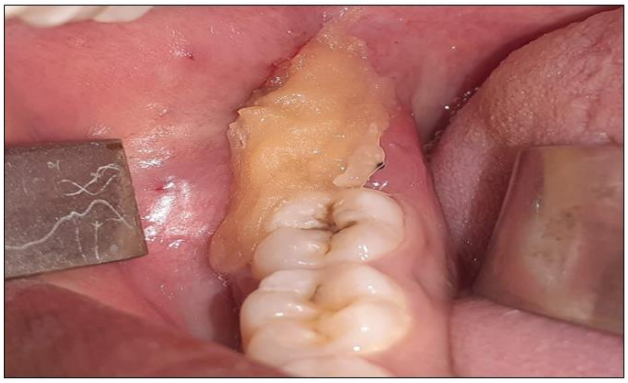


Figure 2 Reso - Pac applied after 3 rd molar surgery at Study Site

Operational definitions and methods of measurement

The following tools were used for data collection procedure:

Assessment of wound healing: Postoperative wound healing, according to the Landry *et al*. healing index.(Table 1). The following evaluation parameters were proposed for post-extraction sites by applying a dichotomic score (0/1) with a total score of 5 presence / absence of redness; presence/absence of suppuration; degree of tissue epithelialization (partial/complete); presence/absence of bleeding; and rates it from score 1 (very poor healing) to 5 (excellent healing) accordingly.

Table 1 Healing scoring system: by Landry *et al*. Healing index score

Sr. No.	Score	Findings
1.	1.Very poor	Tissue colour:≥50% gingival red Response to palpation: Bleeding Granulation tissue: present Incision margin: Not epithelized, with loss epithelium beyond incision margin Suppuration: Present
2.	2.Poor	Tissue colour: ≥50% gingival red Response to palpation: Bleeding Granulation tissue: present Incision margin: Not epithelized, with connective tissue exposed
3.	3.Good	Tissue colour: ≥25% and,50 % gingival red Response to palpation: No bleeding Granulation tissue: None Incision margin: No connective tissue exposed
4.	4.very Good	Tissue colour: <25% gingival red Response to palpation: No bleeding Granulation tissue: None Incision margin: No connective tissue exposed
5.	5. Excellent	Tissue colour: All tissues pink Response to palpation: No bleeding Granulation tissue: None Incision margin: No connective tissue exposed

RESULT

This study was conducted in the department of Oral & Maxillofacial Surgery. This was a prospective randomized split mouth study. It was conducted with the aim to evaluate the efficacy of resorbable dressing after surgical removal bilateral mandibular third molar. A total of 43 patients were included in this study and written informed consent was obtained from all the subjects that participated in this study. All the patients were divided into two groups:

Test group- Patients undergoing surgical extraction of mandibular third molar with Reso pac dressing. Control group- Patients undergoing surgical extraction of mandibular third molar with gauze pack dressing.

To reduce the bias in the study, the observer was blinded to the study and we chose split-mouth study. The data obtained from the study was entered in to excel sheet to prepare a master chart (Table 2) and this data was statistically analyzed using the Paired t test on IBM SPSS 21.0 version (2015) software.

Table 2 Masterchart

Case No.	Age	Sex	Address (Urban / Rural)	Group A Reso Pack Dressing (Wound Healing Score)				Group B Gauze Pack Dressing (Wound Healing Score)			
				Tooth	1st day	3rd day	7th day	Tooth	1st day	3rd day	7th day
1	21	M	0	48	3	4	5	38	2	3	4
2	28	F	1	38	3	4	5	48	3	4	5
3	21	F	0	38	3	4	5	48	2	3	4
4	30	F	1	48	3	4	5	38	3	4	5
5	32	F	0	38	3	4	5	48	2	2	3
6	31	M	1	48	3	4	5	38	2	3	4
7	30	F	0	38	3	4	5	48	2	2	3
8	29	M	1	38	3	4	5	48	2	2	3
9	28	M	1	48	4	5	5	38	3	4	5
10	20	F	1	48	3	4	5	38	2	3	4
11	22	F	1	38	3	4	5	48	3	4	5
12	30	F	1	38	3	4	5	48	3	3	4
13	28	F	1	48	3	4	5	38	2	2	3
14	23	F	0	38	3	4	5	48	2	3	4
15	28	F	1	48	3	4	5	38	3	4	5
16	26	M	1	38	2	3	4	48	2	3	4
17	21	F	0	38	3	4	5	48	3	3	4
18	26	M	0	48	3	4	5	38	3	3	4
19	20	M	1	48	3	4	5	38	2	2	3
20	29	M	1	48	3	4	5	38	2	3	4
21	23	M	1	38	3	4	5	48	2	3	4
22	27	M	0	48	3	4	5	38	3	4	5
23	21	M	1	38	3	4	5	48	2	3	4
24	29	F	1	38	3	4	5	48	3	4	5
25	31	M	0	48	3	4	5	38	2	3	4
26	25	M	0	38	3	4	5	48	2	3	4
27	29	F	1	48	3	4	5	38	2	2	3
28	24	M	0	38	3	4	5	48	2	3	4
29	25	F	1	38	3	4	5	48	2	2	3
30	23	F	1	48	3	4	5	38	2	3	4
31	25	F	0	38	3	4	5	48	3	3	4
32	24	F	1	48	3	4	5	38	3	3	4
33	30	F	0	38	3	4	5	48	2	3	4
34	22	F	0	48	3	4	5	38	2	3	4
35	25	F	0	38	4	5	5	48	3	4	5
36	26	F	1	38	3	4	5	48	2	3	4
37	25	M	0	48	3	4	5	38	2	3	4
38	24	M	1	38	3	4	5	48	2	3	4
39	28	F	1	48	3	5	5	38	3	4	5
40	24	M	0	38	3	4	5	48	2	2	3
41	21	M	1	48	3	4	5	38	3	4	5
42	23	F	1	38	3	4	5	48	3	3	4
43	22	F	1	48	4	5	5	38	2	3	4

Distribution of study participants according to the age

The age of study participants were between 20-40 years old. The maximum 53.5% (n=23) participants were from age between the group of 20-25years. Followed to this 39.5% (n=17), and 7% (n=3) of study participants were from the age group 26-30, 31-35 years respectively. A least 7% (n=3) study participants were the age group between 31-35 years.

Distribution of study participants according to their sex

Amongst all 100% (n=43) the study participants 58.1% (n=25) were female and the rest 41.9% (n=18) were accounts male.

Distribution of study participants according to their address

Amongst all 100% (n=43) the study participants most 60.5% (n=26) of the participants were resided in rural area than rest 39.5% (n=17) were resided in urban area.

Comparison of change in wound healing from day 1 to day 7 in group A and group B

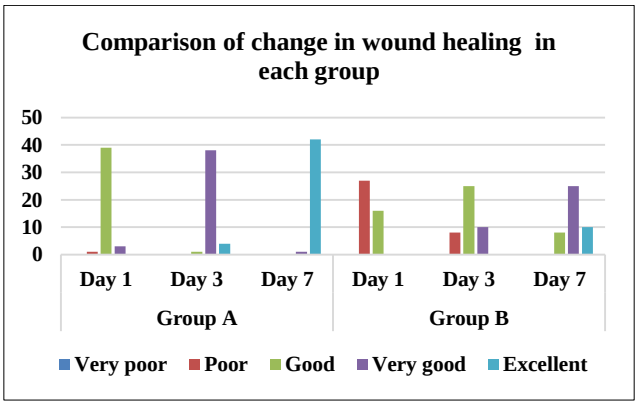
Amongst the comparison of change in wound healing from day 1 to day 7 in group A and group B. In group A, 90.7%(n=39) subjects showed good healing at day1, 88.4% (n=38) subjects showed very good healing at day 3 and97.7 (n= 42) subjects showing excellent healing at day 7. This improvement in healing in group A was significant. In group B, 62.8% (n=27) subjects showed poor healing at day 1, 58.1% (n=25) subjects showed good healing at day 3 and 58.1% (n=25) subjects showed excellent healing at day 7. This improvement in healing in group B was significant.

The above said all the results were statistically highly significant as p<0.001 and (p=0.000). (**Table 3) (Graph 1)**

Table 3 Comparison of change in wound healing from day 1 to day 7 in group A and group B.

Group	Interval	Healing index					Median	p value
		Very poor	Poor	Good	Very good	Excellent		
A	Day 1	0	1 (2.3)	39 (90.7)	3 (7)	0	3	<0.001*
	Day 3	0	0	1 (2.3)	38 (88.4)	4 (9.3)	4	
	Day 7	0	0	0	1 (2.3)	42 (97.7)	5	
B	Day 1	0	27 (62.8)	16 (37.2)	0	0	2	<0.001*
	Day 3	0	8 (18.6)	25 (58.1)	10 (23.3)	0	3	
	Day 7	0	0	8 (18.6)	25 (58.1)	10 (23.3)	4	

* indicates significant difference at p≤0.05.



Graph 1 Comparison of change in wound healing from day 1 to day 7 in group A and group B.

Pairwise comparison of change in wound healing from day 1 to day 7 in group A and group B

All the study participants the pairwise comparison of change in wound healing from day 1 to day 7 in group A and group B. In group A, improvement in healing from day 1 to day 3, from day 1 to day 7 and from day 3 to day 7 was significant. Similar results were seen in group B. (**Table 4)**

Table 4 Pairwise comparison of change in wound healing from day 1 to day 7 in group A and group B.

Pair	Group A	Group B
Day 1 vs Day 3	<0.001*	<0.001*
Day 1 vs Day 7	<0.001*	<0.001*
Day 3 vs Day 7	<0.001*	<0.001*

Intergroup comparison of wound healing between two groups at each interval

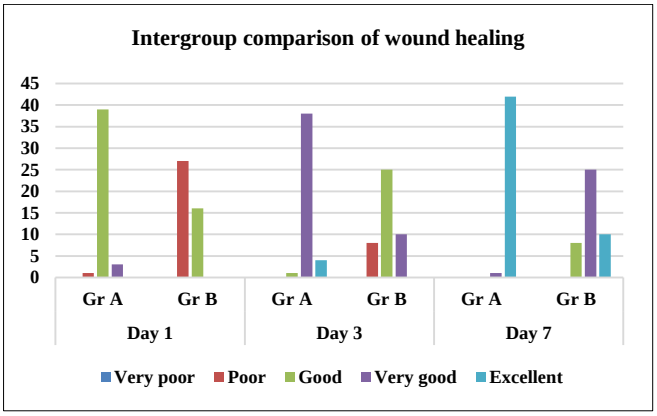
In this study the participants the comparison of wound healing between two groups at each interval. At day 1, 90.7% (n=39) subjects in group A showed good healing as compared to only

37.2 % (n=16) subjects in group B and this difference between two groups was significant. At day 3, 88.4% (n=38) subjects in group A showed very good healing as compared to only 23.3% (n=10) subjects in group B and this difference between two groups was significant. At day 7,97.7% (n=42) subjects in group A showed very good healing as compared to only 23.3 % (n=10) subjects in group B and this difference between two groups was significant. (**Table 5) (Graph 2)**

Table 5 Intergroup comparison of wound healing between two groups at each interval

Interval	Group	Healing index					Median	p value
		Very poor	Poor	Good	Very good	Excellent		
Day 1	Gr A	0	1 (2.3)	39 (90.7)	3 (7)	0	3	<0.001*
	Gr B	0	27 (62.8)	16 (37.2)	0	0	2	
Day 3	Gr A	0	0	1 (2.3)	38 (88.4)	4 (9.3)	4	<0.001*
	Gr B	0	8 (18.6)	25 (58.1)	10 (23.3)	0	3	
Day 7	Gr A	0	0	0	1 (2.3)	42 (97.7)	5	<0.001*
	Gr B	0	0	8 (18.6)	25 (58.1)	10 (23.3)	4	

* indicates significant difference at p≤0.05



Graph 2 Intergroup comparison of wound healing between two groups at each interval.

DISCUSSION

Surgical removal of third molar is the most common ambulatory procedure performed by oral and maxillofacial surgeons worldwide[7,8]. Reasons for removal of third molar include certain diseases, such as caries, periodontitis, pericoronitis and associated pathologies such as cysts and benign tumors, as result of which these teeth are mandatory to extract with a high frequency.[9]The healing of wound is an arrangement of biochemical and cellular action, which aim in returning the integrity and functional ability of tissue after injury. Wound healing is protective function of our body that focuses on quick recovery[1]. As the extraction of a tooth initiates a series of reparative processes involving both hard tissue (i.e., alveolar bone) and soft tissues (periodontal ligament, gingiva) begins.

Various factors are associated with the onset and severity of infection. Infection after a wisdom tooth extraction is most common in the lower rather than the upper jaw. Moreover, the infection rate after surgical removal of impacted third molar is greater than routine tooth extraction[10].

Oral cavity is an exceptional environment in which wound healing takes place in warm oral fluid that consist of millions of microorganisms[1]. That is one of the reasons behind contamination of intraoral wound, it may lead to postoperative wound dehiscence, infection, and pain[11].

Protection of an intraoral site is challenging and is difficult to overcome. As oral cavity has moist environment due to continuous secretion of saliva which causes constant contamination of wound. To protect surgical site an intraoral bandage that is moisture proof and adherent is an ideal solution. Such a bandage may protect the wound from physical, thermal, or microbial damage which occurs due to intake of food or contamination by saliva or plaque[4].

In wound healing process environment plays a critical role. By giving gingival dressing such a favourable environment can be created[12] .

After careful food and plaque debridement wound inspection is done for post-surgical wound healing monitoring. Suture monitoring and removal of suture after proper evaluation of soft tissue healing progression is also an integral part of wound healing monitoring [13].

One important aspect of wound healing is re-epithelialization, which is nothing but the restoration of epidermis by keratinocytes. Breakage of the epithelium barrier indicates vulnerable site for pathogen invasion. Oral bacteria can certainly affect the healing process following disruption of the mucosal barrier [14].

To overcome this post-operative complication wound sites in oral cavity are protected by the various ways like periodic irrigation with saline and povidone iodine, applications of gels and membranes. For healing of oral mucosa topical treatment is more effective than systemic treatment. For oral wound healing various topical treatments, such as adhesive tablets, gels, and films, have been developed. Among these treatment types, films possess properties which involve adhesiveness, flexibility and protect the wound surfaces, reducing pain as well as increasing treatment effectiveness[15].

To prevent drying and desiccation of exposed wound surfaces, it is recommended that abrasions should be covered with a thin layer of antibiotic ointment and dressed with cotton gauze or covered with an antibiotic coated cellulose acetate gauze. For successful wound management flexible, knowledgeable approach to selection of a suitable dressing is important[16].

It is generally advocated to have freshly sutured wounds covered for the first 24-48 hours. Dressing materials have been applied to wounds in the oral cavity in order to reduce postoperative pain, promote healing and prevent infection [16]. Wound dressings should furnish the most optimum conditions for wound healing as well as protect the wound from infection with microorganisms and further trauma. It is important that the dressings must be removed atraumatically, which will avoid further damage to the wound surface during changing the dressing[17].

An ideal wound dressing should have following properties:

1. Remove excessive exudate from the wound without allowing the wound to dry out thereby maintaining a moist environment.
2. Allow gaseous exchanges so that oxygen, water vapour and carbon dioxide may pass in and out of the dressing.
3. Be thermally insulating so as to maintain the wound core temperature at approximately 37-degree celecius.
4. Be impermeable to microorganisms in order to minimize contamination of the wound from outside the wound itself.

5. Be free from either particulate or toxic contamination.
6. Be non-traumatic and not adhere to the wound, so that while changing the dressing it will not damage granulating tissue [18].

Resopac and conventional dressings are completely different. This difference is because of hydrophilic nature of the material that has excellent adhesion properties to the oral tissues. The base material comprises of the cellulose and extracts of myrrh (an aromatic resin derived from wood Commiphor myrrha) and it has antiseptic, astringent and haemostatic properties. It is a self-dissolving medicament which function as a mechanical barrier and disinfectant.

Resopac is a unique material due to its being ready to use, easy to handle and most importantly being non allergic properties. After application within 3 minutes Resopac becomes gelatinous in consistency and forms a completely elastic and adherent bandage over the oral tissues and dissolves slowly over 24 hours. Resopac does not require suturing for retention as it is self-adherent to wet oral mucosa. Setting of Resopac is not affected by saliva or bleeding and it form a true intraoral bandage hence, there is no need for post extraction pressure pack with sterile gauge[19].

As per the study, after setting coepak becomes hard which can exert mechanical pressure over wound and can lead to discomfort and may damage surgical sites. Due to this reason Resopac has been preferred over coepak, as the plasticity of Resopac will avoid the unnecessary pressure over surgical site. This correlates with Leila Gholami *et al*. who observed that in Resopac sites the plaque accumulation is less as compared to coepak site. The reason for that is resopac dissolves spontaneously after few days and these similar findings were also noted in other studies. In Ghanbari's study there was no significant difference found about plaque index with/ without pack sites. Accumulation debris and food under the dressing can cause bad breath and delayed healing, but in case of the resopack group, after its dissolution less plaque is accumulated and it also increases chlorhexidine accessibility to surgical sites which may decrease malodour and accelerates wound healing which also showed that granulation tissue formation was less in the resopac group, and better and faster healing was observed. Similar result was obtained in our study.

Furthermore, cytotoxic effect was also in favor of Resopac which showed higher cell viability. Studies have showed that in comparison to Peri-pac, Barricaid, and Fittydent Reso-pac had only small inhibitory effects on fibroblasts cell proliferation and found to be the most suitable dressing[20].

Resopac helps in early epithelization and accelerates wound healing process and it also protects the wound from contamination by forming a mechanical barrier[19].

This study shows result by comparing wound healing between two groups (group A-Resopac and group B-gauze pack) at each interval. At day 1, 39 subjects in group A showed good healing as compared to only 16 subjects in group B and this difference between two groups was significant. At day 3, 38 subjects in group A showed very good healing as compared to only 10 subjects in group B and this difference between two groups was significant. At day 7, 42 subjects in group A showed very good healing as compared to only 10 subjects in group B and this difference between two groups was significant. This shows that resopac group show significant wound healing as compare to gauze pack (control group).

In the following study pairwise comparison of changes in wound healing from day 1 to day 7 in group A and group B were done, which showed that all the study participants in group A, had significant improvement in healing from day 1 to day 3, from day 1 to day 7 and from day 3 to day 7. Similar results were seen in group B.

In this study, the comparison of wound healing between two groups at each interval was done. At day 1, 90.7% (n=39) subjects in group A showed good healing as compared to only 37.2 % (n=16) subjects in group B and this difference between two groups was significant. At day 3, 88.4% (n=38) subjects in group A showed very good healing as compared to only 23.3% (n=10) subjects in group B and this difference between two groups was significant. At day 7,97.7% (n=42) subjects in group A showed very good healing as compared to only 23.3 % (n=10) subjects in group B and this difference between two groups was significant.

This correlates with SL Raghavan *et al*. who also observed better wound healing and lesser post-operative pain with Resopac when used as intraoral dressing material. This also correlates with in vitro study by Kadk-hodazadech M *et al*. who concluded that resopac demonstrated less cytotoxic effect on human gingival fibroblast cells when compared with Coepack.

Disruption of blood clot after removal of third molar leads to complications like dry socket. A study by Savitha *et al*. showed that post-operative oozing of blood following periodontal surgery was less in Resopac group than Coepack group. In our study there was no case reported with post-operative ooze in the study site as Resopac has hemostatic properties which helps in the clot formation and also protects the clot by forming a mechanical barrier.

Advantages

1. Resopac is ready to use.
2. It is easy to handle.
3. It adapts to tissue easily. It does not require suturing for retention of underlying tissue.
4. Its setting is not affected by saliva or bleeding and forms true intraoral bandage thereby removing the need for a postsurgical pressure pack.
5. It disintegrates completely by itself and hence does not require removal.
6. It permits normal speech, mouth opening, and mastication during the postoperative period.
7. It gives thermal protection.
8. It is biocompatible, painless to apply, non-irritant.
9. Its dissolving property leads to less plaque accumulation.

Limitation of the study

1. Its limitations are its availability.
2. Its high cost.
3. Its disintegration time is short, which require reapplication of resopac in 24 hours

Clinical significance

1. Resopac assist the healing process.
2. It is ideal for protection of wounds.
3. It is ideal as a medicament carrier.

CONCLUSION

In this study Reso-pac Dressing is found to be effective for better wound healing, after the surgical removal of third molar. One more advantage of resopac is that it also offers protection for surgical wound by forming a mechanical barrier thereby preventing contamination and promoting faster healing. It also decreases the food accumulation over surgical site.

To conclude, Reso-pac dressing can be effective and beneficial for the patient and clinician as it will further minimize follow-up visits of the patient to the dental clinic, hence application of Reso-pac is recommended.

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Ethics approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of University named MIDSR Dental college, Latur Institutional Ethical Committee Meeting (Date - 14/01/2021 No - MIDSR/STU/PG/560/34/2021)."

Consent to participate

Informed consent was obtained from all individual participants included in the study. Written informed consent was obtained from the parents.

Consent to publish - Not Required.

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