

Comparative Evaluation of Incidence of Alveolar Osteitis with Bayonet Flap and Envelope Flap in Third Molar Surgery: A Systematic Review

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ABSTRACT

The purpose of this study was to compare two traditionally used surgical techniques to determine if a specific incision/flap design technique can predictably reduce the incidence of complications, particularly AO, in impacted mandibular third molar removal surgery. The aim of this systematic review is to assess the efficacy of Bayonet flap with Envelope flap on the Incidence of Alveolar Osteitis in impacted mandibular third molar surgery. The Databases of PubMed, Cochrane and Google Scholar were searched for the related topics along with a complimentary manual search of all oral surgery journals till December 2019. Articles were selected based on the inclusion criteria, which included all RCTs. Based on the study findings; the modified triangular flap may be superior to the envelope flap in terms of incidence in alveolar osteitis. The modified triangular flap design appears more advantageous than the envelope flap in terms of pain, trismus, and wound dehiscence in the first 3 days following surgical removal of impacted third molar and may have a better impact on QOL during this time. This may also indicate the clinical validity in terms of its ability to differentiate between the two flap groups and the excellent compatibility exhibited with clinically determined alveolar osteitis. Further comparative further studies involving larger populations are still required to determine the best flap technique for third molar surgery.

Key words: Alveolar osteitis, Bayonet flap, Envelope flap, Molar surgery

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INTRODUCTION

Surgical removal of impacted third molars is a common procedure in oral and maxillofacial surgery [1-4]. Since the third molar region contains loose connective tissue largely consisting of blood and lymph vessels [5,6], inflammatory complications such as pain, swelling, trismus, and alveolitis are generally seen in the immediate post-operative period [5-8]. There are medical, legal, and economic implications of postoperative complications. These complications are still regarded as a major problem for both surgeons and patients [9]. Various surgical approaches have been employed and compared in the search for a solution. The flap design is an important factor affecting the frequency and severity of postoperative complications [10-12].

Alveolar osteitis (AO), also known as “dry socket,” is reported to be a relatively common complication following impacted mandibular third molar removal surgery, where the incidence has been reported to be as high as 45% [13]. Crawford first described the term in 1876, and since then the condition has been referred to as localized osteitis, alveolar osteitis, alveolgia, alveolitis sicca Dolorosa, septic socket, necrotic socket, fibrinolytic alveolitis, as well as localized osteomyelitis [14]. Though the etiology of AO remains debatable, its cause has often been attributed to the partial or total disintegration of the blood clot in the alveolar socket, which leads to a loss of the reparative agents normally present in coagulated blood. AO typically presents with painful, unfilled sockets at the surgical site 2-5 days post-extraction, commonly accompanied by unpleasant taste, halitosis, and pain radiating to one or both ears [13]. To help reduce the incidence of AO as well as other complications, studies have investigated the effects of a wide variety of proposed etiologic factors such as antibiotics, chlorhexidine rinses,

tobacco products, menstrual status, and the age of the patient, but few investigators have taken into account the potential differences in the efficacy of alternative surgical techniques in preventing the initiation of AO.

One such surgical alternative in consideration is the alteration of flap designs and primary closure. In most modern oral and maxillofacial surgery offices/clinics, the most common approaches when accessing impacted mandibular third molars utilize either the envelope flap (EF) with a distal relieving incision extended laterally to the ramus or the modified triangular flap (MTF) [15]. While both techniques provide adequate access as well as space to perform the necessary osteotomy to expose the dental crown for tooth removal, these designs do not allow for primary closure over the sound bone which has been thought to contribute to higher incidences of complications like AO [2].

The surgical removal of third molar teeth may result in a number of complications, including alveolar osteitis (AO). Third molar surgery has been associated with a variety of complications and side effects. The flap design is one of the factors influencing the severity of these complications and side effects.

The envelope flap with a distal relieving incision to the ramus and the triangular flap, which was first described by Szmyd are the most common approaches in impacted third molar surgery. Several studies have been conducted to compare the effect of those flaps on pain, swelling, trismus, and primary wound healing in the postoperative period. Although it has been reported that the influence of flap design is of importance on wound healing after third molar surgery, there is not an agreement. Whereas some authors reported that flap design had no clinical significance in point of postoperative pain and trismus, others stated that triangular flap is more advantageous for primary wound healing and wound dehiscence was less when a triangular.

From the existing literature, it is obvious that the type of incision is an important consideration in the surgical removal of the impacted teeth. Further, it is vital to note that the design of the flap is a critical parameter in the surgery of third molars. The design of the flap influences the visibility and accessibility to the impacted

tooth and also has an impact on the subsequent healing process of the surgical defect created following surgery.

From this study it is concluded that incidence of alveolar osteitis with modified triangular flap is less compared to envelope flap in the patients who have undergone mandibular third molar surgery. With a rich case bank established over 3 decades we have been able to publish extensively in our domain [16-26]. Based on this inspiration we aim to do a systematic review on comparative evaluation of incidence of alveolar osteitis with bayonet flap and envelope flap in third molar surgery.

AIM

The aim of this systematic review was to analyze the existing literature to compare and evaluate envelope flap and bayonet flap in preventing the occurrence of alveolar osteitis following mandibular third molar surgery.

STRUCTURED QUESTION

Is bayonet flap effective in lowering the postoperative incidence of alveolar osteitis compared to envelope flap following mandibular third molar surgery?

PICO analysis

Population: Patients undergoing mandibular third molar surgery.

Intervention: Bayonet flap.

Comparison: Envelope flap.

Outcome: Alveolar Osteitis.

MATERIALS AND METHODS

Search methodology

Following Figures 1A-R and 2 explains the search methodology.

Inclusion criteria

Criteria for considering studies for the Review

Types of studies

Randomized controlled trials

Clinical trials

Types of participants

Patients undergoing mandibular third molar surgery.

#31	Add	Search wisdom teeth extractions	512	03/02/20
#30	Add	Search wisdom teeth extraction	4379	03/01/59
#29	Add	Search surgical removal of impacted wisdom teeth	1127	03/00/18
#28	Add	Search extraction of wisdom teeth	4379	02/59/23
#27	Add	Search surgical extraction of wisdom teeth	3928	02/58/23
#26	Add	Search surgical removal of wisdom teeth	1830	02/53/17
#25	Add	Search removal of wisdom teeth	2196	02/52/36
#24	Add	Search wisdom teeth surgeries	4320	02/51/42
#23	Add	Search wisdom teeth surgery	6109	02/49/39
#22	Add	Search wisdom teeth removal	2196	02/48/59
#7	Add	Search third molar extraction	4268	02/48/18
#21	Add	Search wisdom tooth extraction	4434	02/47/33
#20	Add	Search third molar surgeries	4205	02/45/39
#19	Add	Search surgical removal of impacted third molars	1167	02/44/53
#18	Add	Search extraction of third molars	4520	02/44/00
#17	Add	Search surgical removal of third molars	1909	02/27/35
#16	Add	Search removal of third molars	2348	02/26/53
#15	Add	Search surgical removal of impacted wisdom tooth	1129	02/25/08
#14	Add	Search extraction of wisdom tooth	4434	02/24/21
#13	Add	Search surgical extraction of wisdom tooth	3971	02/23/42
#12	Add	Search surgical removal of wisdom tooth	1840	02/22/59
#11	Add	Search removal of wisdom tooth	2210	02/20/15
#10	Add	Search wisdom tooth surgery	6165	02/19/41
#9	Add	Search wisdom tooth removal	2210	02/19/26
#8	Add	Search surgical removal of impacted third molar	1104	02/17/49
#6	Add	Search extraction of third molar	4268	02/17/05
#5	Add	Search surgical extraction of third molar	3836	02/16/45
#4	Add	Search surgical removal of third molar	1790	02/16/27
#3	Add	Search removal of third molar	2139	02/16/04
#2	Add	Search third molar removal	2139	02/15/51
#1	Add	Search third molar surgery	5926	02/15/32

Figure 1A: Search methodology.

#61	Add	Search mandibular wisdom tooth extraction	2091	04/01/40
#60	Add	Search mandibular third molar surgeries	2000	04/00/35
#59	Add	Search surgical removal of impacted mandibular third molars	701	03/59/26
#58	Add	Search extraction of mandibular third molars	2135	03/54/17
#57	Add	Search surgical removal of mandibular third molars	1075	03/51/52
#56	Add	Search removal of mandibular third molars	1254	03/50/45
#55	Add	Search surgical removal of impacted mandibular wisdom tooth	692	03/48/35
#54	Add	Search extraction of mandibular wisdom tooth	2091	03/46/18
#53	Add	Search surgical extraction of mandibular wisdom tooth	1894	03/44/45
#52	Add	Search surgical removal of mandibular wisdom tooth	1061	03/43/10
#51	Add	Search removal of mandibular wisdom tooth	1223	03/41/39
#50	Add	Search mandibular wisdom tooth surgery	2988	03/40/44
#49	Add	Search mandibular wisdom tooth removal	1223	03/38/17
#48	Add	Search surgical removal of impacted mandibular third molar	686	03/35/03
#47	Add	Search extraction of mandibular third molar	2049	03/33/55
#46	Add	Search surgical extraction of mandibular third molar	1859	03/32/35
#45	Add	Search surgical removal of mandibular third molar	1046	03/31/03
#44	Add	Search removal of mandibular third molar	1202	03/25/20
#43	Add	Search mandibular third molar removal	1202	03/22/00
#42	Add	Search mandibular third molar surgery	2915	03/18/49
#41	Add	Search mandibular wisdom teeth	4482	03/16/59
#40	Add	Search mandibular wisdom tooth	4515	03/15/36
#39	Add	Search mandibular third molars	4876	03/10/57
#38	Add	Search mandibular third molar	4409	03/10/15
#34	Add	Search wisdom teeth	11293	03/09/38
#37	Add	Search wisdom tooth	11319	03/09/17
#36	Add	Search third molars	13284	03/08/58
#35	Add	Search third molar	10912	03/08/33
#33	Add	Search extractions of third molars	540	03/04/25
#32	Add	Search third molar extractions	495	03/03/36
#31	Add	Search wisdom teeth extractions	512	03/02/56

Figure 1B: Search methodology.

-	+	#14	surgical removal of third molars	Limits	471
-	+	#15	extraction of third molars	Limits	911
-	+	#16	surgical removal of impacted third molars	Limits	375
-	+	#17	third molar surgeries	Limits	85
-	+	#18	wisdom tooth extraction	Limits	218
-	+	#19	third molar extraction	Limits	1518
-	+	#20	wisdom teeth removal	Limits	166
-	+	#21	wisdom teeth surgery	Limits	221
-	+	#22	wisdom teeth surgeries	Limits	13
-	+	#23	removal of wisdom teeth	Limits	166
-	+	#24	surgical removal of wisdom teeth	Limits	117
-	+	#25	surgical extraction of wisdom teeth	Limits	121
-	+	#26	extraction of wisdom teeth	Limits	218
-	+	#27	surgical removal of impacted wisdom teeth	Limits	79
-	+	#28	wisdom teeth extraction	Limits	218
-	+	#29	wisdom teeth extractions	Limits	34
-	+	#30	third molar extractions	Limits	203

Figure 1K: Search methodology.

-	+	#30	third molar extractions	Limits	203
-	+	#31	extractions of third molars	Limits	121
-	+	#32	third molar	Limits	2294
-	+	#33	third molars	Limits	1605
-	+	#34	wisdom tooth	Limits	327
-	+	#35	wisdom teeth	Limits	327
-	+	#36	mandibular third molar	Limits	845
-	+	#37	mandibular third molars	Limits	623
-	+	#38	mandibular wisdom tooth	Limits	98
-	+	#39	mandibular wisdom teeth	Limits	98
-	+	#40	mandibular third molar surgery	Limits	703
-	+	#41	mandibular third molar removal	Limits	399
-	+	#42	removal of mandibular third molar	Limits	399
-	+	#43	surgical removal of mandibular third molar	Limits	299
-	+	#44	surgical extraction of mandibular third molar	Limits	364
-	+	#45	extraction of mandibular third molar	Limits	604
-	+	#46	surgical removal of impacted mandibular third molar	Limits	299

Figure 1L: Search methodology.

Types of intervention

Postoperative incidence of alveolar osteitis is evaluated using bayonet flap for the patients undergoing mandibular third molar surgery.

Types of comparison

Postoperative incidence of alveolar osteitis is

evaluated using envelope flap for the patient undergoing mandibular third molar surgery.

Types of outcome measures

Post-operative incidence of alveolar osteitis for the patient undergoing mandibular third molar surgery.

-	+	#46	surgical removal of impacted mandibular third molar	Limits	239
-	+	#47	mandibular wisdom tooth removal	Limits	56
-	+	#48	mandibular wisdom tooth surgery	Limits	73
-	+	#49	removal of mandibular wisdom tooth	Limits	56
-	+	#50	surgical removal of mandibular wisdom tooth	Limits	47
-	+	#51	surgical extraction of mandibular wisdom tooth	Limits	47
-	+	#52	extraction of mandibular wisdom tooth	Limits	75
-	+	#53	surgical removal of impacted mandibular wisdom tooth	Limits	39
-	+	#54	removal of mandibular third molars	Limits	317
-	+	#55	surgical removal of mandibular third molars	Limits	240
-	+	#56	extraction of mandibular third molars	Limits	449
-	+	#57	surgical removal of impacted mandibular third molars	Limits	198
-	+	#58	mandibular third molar surgeries	Limits	43
-	+	#59	mandibular wisdom tooth extraction	Limits	75
-	+	#60	mandibular third molar extraction	Limits	604
-	+	#61	mandibular wisdom teeth removal	Limits	56
-	+	#62	mandibular wisdom teeth surgery	Limits	73

Figure 1M: Search methodology.

-	+	#62	mandibular wisdom teeth surgery	Limits	73
-	+	#63	mandibular wisdom teeth surgeries	Limits	7
-	+	#64	removal of mandibular wisdom teeth	Limits	56
-	+	#65	surgical removal of mandibular wisdom teeth	Limits	47
-	+	#66	surgical extraction of mandibular wisdom teeth	Limits	47
-	+	#67	extraction of mandibular wisdom teeth	Limits	75
-	+	#68	surgical removal of impacted mandibular wisdom teeth	Limits	39
-	+	#69	mandibular wisdom teeth extraction	Limits	75
-	+	#70	mandibular wisdom teeth extractions	Limits	13
-	+	#71	mandibular third molar extractions	Limits	88
-	+	#72	extractions of mandibular third molars	Limits	68
-	+	#73	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40 OR #41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47 OR #48 OR #49 OR #50 OR #51 OR #52 OR #53 OR #54 OR #55 OR #56 OR #57 OR #58 OR #59 OR #60 OR #61 OR #62 OR #63 OR #64 OR #65 OR #66 OR #67 OR #68 OR #69 OR #70 OR #71 OR #72	Limits	3004
-	+	#74	envelope flap	Limits	3727
-	+	#75	envelope flaps	Limits	1994
-	+	#76	szmyd flap	Limits	3
-	+	#77	szmyd flaps	Limits	2

Figure 1N: Search methodology.

Exclusion criteria

- The following studies were excluded
- Review articles.
- Animal studies.
- Invitro studies.

Studies not meeting inclusion criteria.

Languages other than English.

Sources used

The data bases of PubMed, cochrane and google scholar were searched for the related topics.

-	+	#78	szmyd incision	Limits	2
-	+	#79	szmyd incisions	Limits	0
-	+	#80	#74 OR #75 OR #76 OR #77 OR #78 OR #79	Limits	4347
-	+	#81	bayonet flap	Limits	2
-	+	#82	bayonet flaps	Limits	2
-	+	#83	bayonet incision	Limits	3
-	+	#84	bayonet incisions	Limits	1
-	+	#85	wards incision	Limits	17
-	+	#86	wards incisions	Limits	6
-	+	#87	modified triangular flap	Limits	22
-	+	#88	modified triangular flaps	Limits	13
-	+	#89	modified triangular incision	Limits	7
-	+	#90	modified triangular incisions	Limits	1
-	+	#91	modified partial newmann flap	Limits	0
-	+	#92	modified partial newmann flaps	Limits	0
-	+	#93	modified szmyd incision	Limits	1
-	+	#94	modified szmyd incisions	Limits	0

Figure 10: Search methodology.

-	+	#91	modified partial newmann flap	Limits	0
-	+	#92	modified partial newmann flaps	Limits	0
-	+	#93	modified szmyd incision	Limits	1
-	+	#94	modified szmyd incisions	Limits	0
-	+	#95	modified szmyd flap	Limits	1
-	+	#96	modified szmyd flaps	Limits	1
-	+	#97	#81 OR #82 OR #83 OR #84 OR #85 OR #86 OR #87 OR #88 OR #89 OR #90 OR #91 OR #92 OR #93 OR #94 OR #95 OR #96	Limits	44
-	+	#98	#73 AND #80 AND #97	Limits	15
-	+	#99	Type a search term or use the S or MeSH buttons to compose	Limits	N/A

Highlight orphan lines

Figure 1P: Search methodology.

We used free-text terms to search the following journals.

British Journal of Oral and Maxillofacial Surgery.

International Journal of Oral and Maxillofacial Surgery.

Journal of Oral and Maxillofacial Surgery.

Journal of Cranio Maxillofacial Surgery.

Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology.

Only articles in English and human species were applied during the electronic search to include all the possible clinical trials that are relevant for the search phase of the systematic review. A reference list of the identified randomized trials was also checked for possible additional studies.

Search flow chart (Figure 2)

Data collection and analysis

Screening and selection

An electronic search was carried out using

Search Term	Limits
#92 modified partial newmann flaps	0
#93 modified szmyd incision	1
#94 modified szmyd incisions	0
#95 modified szmyd flap	1
#96 modified szmyd flaps	1
#97 #81 OR #82 OR #83 OR #84 OR #85 OR #86 OR #87 OR #88 OR #89 OR #90 OR #91 OR #92 OR #93 OR #94 OR #95 OR #96	44
#98 #73 AND #80 AND #97	15
#99 alveolar osteitis	150
#100 dry socket	219
#101 dry sockets	47
#102 alveolar periostitis	2
#103 #99 OR #100 OR #101 OR #102	285
#104 #98 AND #103	10
#105 Type a search term or use the S or MeSH buttons to compose	N/A

Figure 1Q: Search methodology.

3 Trials matching "#104 - #98 AND #103"

Cochrane Central Register of Controlled Trials
Issue 1 of 12, January 2020

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Order by Relevancy Results per page 25

- Novel incision design and primary flap closure reduces the incidence of alveolar osteitis and infection in impacted mandibular third molar surgery**

JA Elo, HH Sun, F Dong, R Tandon, HM Singh
Oral surgery, oral medicine, oral pathology and oral radiology, **2016**, 122(2), 124-133 | added to CENTRAL: 30 September 2017 | 2017 Issue 9
PubMed Embase
- The influence of flap design on sequelae and quality of life following surgical removal of impacted mandibular third molars: a split-mouth randomised clinical trial**

G Şimşek Kaya, G Yapıcı Yavuz, N Saruhan
Journal of oral rehabilitation, **2019**, 46(9), 828-835 | added to CENTRAL: 31 December 2019 | 2019 Issue 12
PubMed
- The influence of flap design on sequelae and quality of life following surgical removal of impacted mandibular third molars: a split-mouth randomized clinical trial**

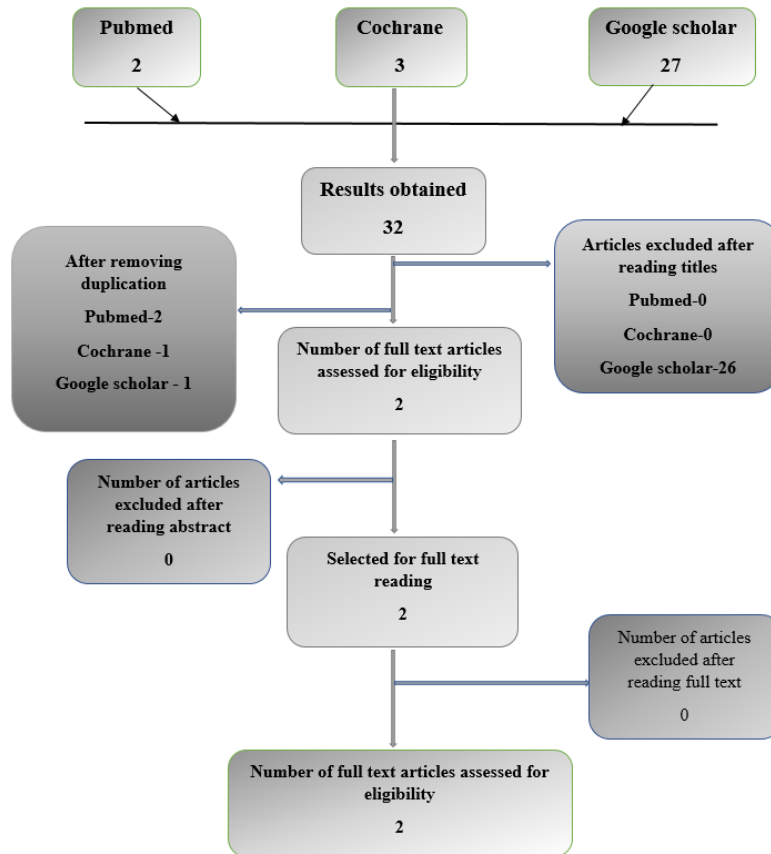
G Şimşek Kaya, G Yapıcı Yavuz, N Saruhan
Journal of oral rehabilitation, **2019** | added to CENTRAL: 30 June 2019 | 2019 Issue 06
Embase

Figure 1R: Search methodology.

the keywords in the Search engines- PubMed, Cochrane, and Google Scholar which yielded a total of 32 articles. Based on pre-set inclusion and exclusion criteria, the titles of the studies identified from the search were assessed independently by two review authors. Conflicts concerning the inclusion of the studies were resolved by discussion. Twenty-six articles were excluded after reading titles. Two titles

were identified from the search after excluding four duplications. Abstracts of selected articles were reviewed independently. No articles were excluded after reading the abstract. Full-text articles were retrieved for two relevant studies.

The reference list of the full-text articles were reviewed for identifying additional studies. Titles of articles relevant to the review were



Figures 2: Flow chart.

selected by discussion. Quality Assessment criteria to evaluate the studies were decided by two review authors in accordance with CONSORT guidelines. The risk of bias for each study was independently assessed by the review authors and conflicts concerning the risk of bias were sorted by discussion.

Data extraction

Data extraction for general characteristics of studies and variables of outcome was done.

For each trial the following data were recorded

Author and journal.

Study design.

Sample size.

Participants and group.

Methodology.

Outcome measures.

Results.

Conclusion.

Variable of interest

It is given in table 1.

Table 1: Variable interest.

S.No	Variables Of Interest
1	Alveolar osteitis

Quality assessment

The quality assessment of included trials was undertaken independently as a part of data extraction process. Four main quality criteria were examined.

1. Method of Randomization, recorded as
 - a) YES- Adequate as described in the text.
 - b) NO- Inadequate as described in the text.
 - c) Unclear in the text.
2. Allocation Concealment, recorded as
 - a) YES- Adequate as described in the text.
 - b) NO- Inadequate as described in the text.
 - c) Unclear in the text.
3. Outcome assessors Blinded to intervention, recorded as
 - a) YES- Adequate as described in the text.
 - b) NO- Inadequate as described in the text.

c) Unclear in the text.

4. Completeness of Follow up (was there a clear explanation for withdrawals and dropouts in each treatment group) assessed as

- a)YES- Dropouts were explained.
- b) NO- Dropouts were not explained.
- c) None- No Dropouts or withdrawals.

Other methodological criteria examined included:

1. Presence or Absence of sample size calculation.
2. Comparability of Groups at the start.
3. Clear Inclusion or Exclusion criteria.
4. Presence or Absence of estimate of measurement error.

Risk of bias in included studies

The study was assessed to have a “High risk” of bias if it did not record a “Yes” in three or more of the four main categories, "Moderate Risk" if two out of four categories did not record a "Yes", and “Low Risk” if all the four categories recorded if randomization assessor, Blinding and Completeness of follow up were considered Adequate. In case of non-randomized and clinical trials without control group, it is recorded as not applicable.

RESULTS AND DISCUSSION

Table 2 shows the general characteristics of the studies.

Table 2: General characteristics of the studies.

S.No	Author	Year	Study design	Sample size	Age	Technique Used	Method of Evaluation
1	Jeffrey A Elo et al	2016	Randomized single-blinded clinical study	N=196	No age limit	One group Bayonet flap and another group Envelope flap Two groups got novel incision design	Post-operative incidence of alveolar osteitis using clinical assessment
2	Goksel Simsek Kaya	2019	Randomized clinical study	N=60	18-31yrs	One group Bayonet flap and another group Envelope flap	Post-operative incidence of alveolar osteitis using clinical assessment

Table 3: Data extraction.

S.No.	Author and year	Technique used	Method of evaluation	Incidence values	Outcomes
1	Jeffrey A Elo et al. 2016	One group Bayonet flap and another group Envelope flap. Two groups got novel incision design	Post-operative incidence of alveolar osteitis using clinical assessment	Post-operative alveolar osteitis Bayonet flap group=0.10 Envelope flap group=0.13	Post-operative incidence of alveolar osteitis was significantly less with bayonet flap
2	Goksel Simsek Kaya et al. 2019	One group Bayonet flap and another group Envelope flap	Post-operative incidence of alveolar osteitis using clinical assessment	Post-operative alveolar osteitis Bayonet flap group=0 Envelope flap group=0.14	Post-operative incidence of alveolar osteitis was significantly less with bayonet flap

Table 3 explains the data extraction.

Table 4 shows the evidence level of selected articles.

Table 5 shows the risk of bias- major criteria.

Table 6 determines risk of bias-minor criteria.

Table 7 shows the summation for individual parameter.

Figure 3 illustrates the comparison of incidence of alveolar Osteitis.

Impacted third molar surgery is a very common procedure. A variety of factors, such as the duration of the operation, difficulty of the surgery, magnitude of the osteotomy, lack of oral hygiene, or the surgeon’s experience, affect the severity of postoperative complications and morbidity. It has also been proposed that the flap design is effective in the postoperative course and, therefore, results of different flaps have been evaluated.

The two flap designs used in this study are both frequently used and have acceptance among oral surgeons. The envelope flap has a broad base and, consequently, a good blood supply. The surgical site can be adequately exposed, and the sulcular incision can be extended if needed. It has some disadvantages, however. A larger flap also means more osteoclastic activity and more bone loss. Wound dehiscence distal to the second molar is said to be another shortcoming of envelope flap design. These gaps are generally located adjacent to the second molar, serve as a

Table 4: Evidence level of selected articles.

S.No	Author and year	Study design	Level of Evidence
1	Jeffrey A Elo et al 2016	Randomized single-blinded study	1
2	Goksel Simsek Kaya et al 2019	Randomized clinical study	1

Table 5: Risk of bias- major criteria.

S.No.	Study	Randomization	Allocation concealment	Assessor Blinded	Dropouts described	Risk of Bias
1	Jeffrey A Elo et al 2016	Yes	Yes	Yes	None	Moderate
2	Goksel Simsek Kaya et al	Yes	Yes	Yes	None	Moderate

Table 6: Risk of bias-minor criteria.

S.No.	Study	Sample Justified	Baseline Comparison	I/E Criteria	Method of error
1	Jeffrey A Elo et al 2016	Yes	Yes	Yes	No
2	Goksel Simsek Kaya et al 2019	Yes	Yes	Yes	No

Table 7: Summation table for individual parameter.

S.No	Author	Year	Evaluation period	Outcome
1	Jeffrey A Elo et al. 2016	2016	POD 4th day	There wasn't much significant difference between the two groups, but results are in favor of Bayonet flap
2	Goksel Simsek Kaya et al. 2019	2019	POD 4th day	There was a significant difference between two groups, results are in favor of Bayonet group

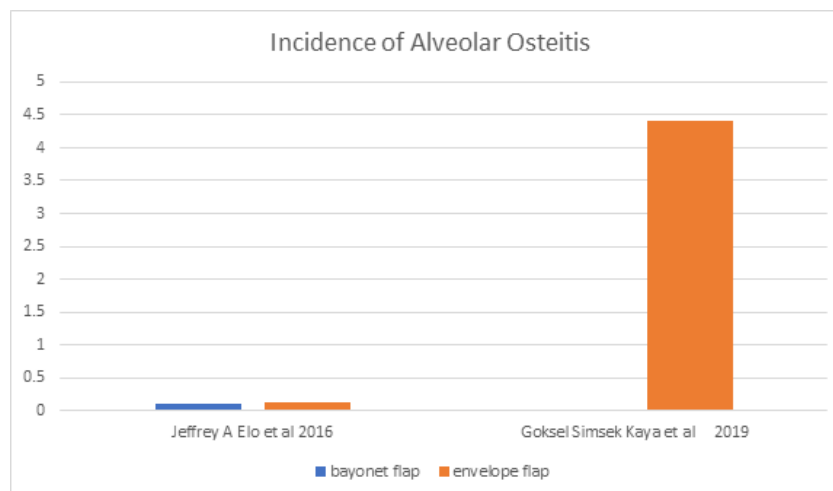


Figure 3: Comparison of incidence of alveolar Osteitis.

trap for foods, and maybe a good environment for bacteria, which may lead to alveolar osteitis and soft tissue abscesses. Because less tissue is elevated and the buccal aspect of the second molar is protected, the modified triangular flap has been asserted to be a more conservative technique.

Alveolar osteitis (AO) is often a significant cause of pain and discomfort following mandibular third molar removal surgery. There is still no consensus concerning whether or not the flap design applied in third molar surgery affects the post-operative period [27,28]. Although some authors have reported that post-operative comfort and wound healing are directly correlated with the flap design applied [27]. The degree of swelling and the severity of pain are

the principal indicators of post-operative patient comfort following surgical removal of third molar [29]. There is no consensus in the literature on the effect of flap design on post-operative pain, although flap design had no direct effect on pain, the incidence of alveolar osteitis was higher in patients receiving envelope flaps, who therefore had higher VAS scores [30].

Mucoperiosteal flap preparation results in increasing osteoclast activity at the alveolar process, thus triggering the loss of alveolar bone [7,31]. Soft tissue tensions due to hematoma and masticatory muscle movements in the surgical field may induce wound dehiscence in the first few days post-operatively. Dehiscence creates a potential trap for food particles and a good environment for bacteria, hence leading to post-

operative alveolar osteitis, soft tissue abscesses and long-term discomfort and additional treatment requirements [3,7,31,32]. From the patient's perspective, dehiscence may prolong discomfort and cause continuous pain [31]. Our results support those of previous studies reporting frequent wound dehiscence in the first stage of wound healing in patients receiving envelope flaps [31,32,33].

The purpose of this study was to compare the bayonet flap against the envelope flap in reducing the incidence of AO. Though its exact etiology is unknown, many potential risk factors for AO have been identified. Several preventative techniques have been proposed to address this issue with varying degrees of success. There are reports that regular irrigation with a 0.12% chlorhexidine solution both pre-operatively and up to 7 days postoperatively can lead to a better prognosis [15,34]. In addition, topical as well as systemic antibiotics (such as tetracycline and metronidazole) may help reduce the prevalence of pathologic states [35,36].

Envelope flap

The envelope flap was performed with a sulcular incision extending from the first molar to the second and a distal relieving incision to the mandibular ramus. The incision was made from a point immediately medial to the external oblique ridge as far as the center of the distal line angle of the second molar. A sulcular buccal incision was then made from that point made to the center of the first molar. The mucoperiosteal flap was elevated completely as far as the buccal surface of the mandible. The lingual tissues were only retracted superficially (Figure 4).

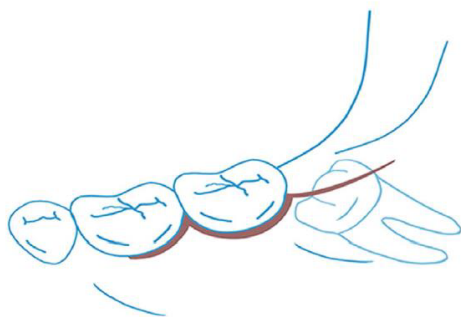


Figure 4: Envelope flap.

Modified triangular flap

The modified triangular flap was implemented as described by Szmyd [37] and as subsequently modified by Jakse. The first part of the incision

was similar to that described in the envelope flap technique. The incision extended from the mandibular ramus as far as the distobuccal crown edge of the second molar. An oblique perpendicular incision of approximately 10 mm was then made to the mandibular vestibulum. The periodontium of the second molar was only disturbed at the distofacial edge. A lingual mucoperiosteal flap similar to that used with the envelope flap was also raised (Figure 5).

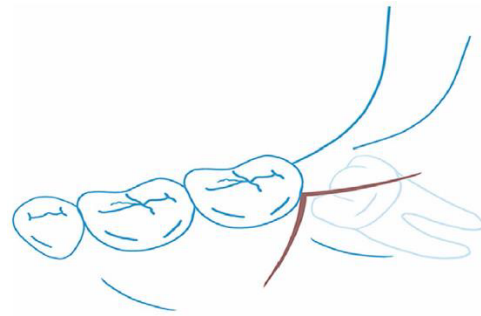


Figure 5: Bayonet flap.

Interpretation of results

In a study conducted by other authors in 2016, a total sample size of 196 with one group consisting of 61 patients and others with 65 patients. One group was given an envelope flap and one group was given bayonet flap. In the envelope flap group, after undergoing mandibular third molar surgery, the occurrence of AO was 8 out of 61 and was 7 out of 65 with bayonet flap. The incidence was 0.13 in the envelope flap group and 0.10 in the bayonet flap group. In the study conducted by other authors in 2019, a total number of 30 patients having bilateral impacted mandibular third molar with each group consisting of 30 patients, one group was given envelope flap and another group received bayonet flap. There was a significant reduction in the occurrence of AO in the bayonet flap group with 0 out of 30 compared to envelope flap group where the occurrence of AO was 4 out of 30.

SUMMARY

The aim of this systematic review is to assess the efficacy of Bayonet flap with Envelope flap on the Incidence of Alveolar Osteitis in impacted mandibular third molar surgery. There were 2 randomized controlled trials included in this systematic review. Both of the studies have used envelope flap and bayonet flap to compare the incidence of postoperative alveolar osteitis occurrence. In these studies, only less number

of patients was evaluated. So more studies to be done in the future. Thus in this systematic review, we conclude that modified triangular flap (bayonet flap) had a lesser incidence of alveolar osteitis when compared to envelope flap in mandibular third molar surgery.

CONCLUSION

In this systematic review we have concluded that, on average, modified triangular flap (bayonet flap) had a lesser incidence of alveolar osteitis when compared to envelope flap in mandibular third molar surgery. More studies have to be done to evaluate the efficacy of the flaps.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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