INFLAMMATORY RESPONSE AND MICROBIAL ADHERENCE IN INTRAORAL RESORBABLE SUTURES-A SYSTEMATIC REVIEW

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Resorbable sutures, nonresorbable sutures, polyglycolic acid sutures, microbial adherence, inflammatory response

A B S T R A C T

Statement of the problem: The degree of microbial adherence and inflammatory response invoked by intraorally placed resorbable sutures and intraorally placed non resorbable sutures is not clear and needs to be investigated further.

Aim

- To analyse the inflammatory response and microbial adherence in intraoral resorbable sutures.
- To analyse the inflammatory response and microbial adherence in intraoral non resorbable sutures.
- To compare the effectiveness of both.

Sources used: An electronic search was conducted for scholarly articles about the inflammatory response and microbial adherence invoked by intraorally placed resorbable and non resorbable sutures in pubmed. The search methodology applied was a combination of MESH terms and suitable keywords based on PICO formulated for the review.

Search methodology: The database search yielded 12 articles out of which 3 articles were discarded after reading the abstract. Full texts were obtained for the remaining 9 articles. 5 articles were selected based on the inclusion criteria and 4 articles were excluded. The finally selected 5 articles were subjected to data extraction and statistical analysis.

Results and conclusion: Non resorbable silk sutures were found to cause more intense and prolonged inflammatory response when compared to intra orally placed resorbable sutures. Non resorbable silk sutures seemed to conduct bacterial migration more easily than to intra orally placed resorbable sutures.

INTRODUCTION

Wound closure by suturing is a critical and significant event in general as well as in oral surgery. (Lecknes K.N, 2005) Suture materials play an important role in healing, enabling reconstruction and reassembly of tissue separated by the surgical procedure or trauma, and at the same time facilitating and promoting healing. Suture materials are used everyday in oral surgery, and are considered to be substances most commonly implanted in human body. (Banche G et al, 2007) (DraganGazivoda et al, 2015) Suture materials are classified on the basis of several criteria, and these are usually origin, structure, and biological properties. (Çapanoğlu D. Sutures, 1999-2000) By origin, sutures can be natural and synthetic; by structure they can be monofilament and multifilament, while by biological properties they can be absorbable and non-absorbable. (DraganGazivoda et al, 2015) Development of synthetic suture materials introduced a few suture materials of different characteristics, good quality and acceptable price.(Sortino F et al, 2008) tension, dimension stability, knot safety and adequate flexibility to avoid damaging oral mucosa. Furthermore, ideal suture material needs to provide limited bacterial adhesion and wound contamination otherwise there are innumerable chances that the sutures themselves can become the source of inflammation, which may compromise reparation and regeneration. (Stone Ik et al, 1985) (Stone Ik et al, 1988) (Racey GL et al, 1978) However the ideal suture material has neither been found nor been manufactured. In particular, sutures used in oral surgery behave differently from those used in other parts of the body because of the quality of tissues involved, the constant presence of saliva and functions related to speech, mastication and swallowing. (DraganGazivoda et al, 2015)

Oral surgeries are primarily finished by suturing the surgical wound. The type of suture material used depends on the site of the surgical opening. Non resorbable sutures are usually used in cases where there is requirement of suturing of overlying tissues. These are removed 7-8days post...
operatively. Resorbable sutures are used in cases where it is not possible to remove the placed sutures especially in case of persons with disability, not able to cooperate, and patients located in remote locations who do not have the accessibility to the hospitals.

However we only have an idea regarding the situations and conditions in which both the sutures can be used, where as we do not have an idea regarding the behaviour of these in the oral cavity as the oral environment is characterized by numerous specificities, primarily presence of saliva. (Peterson L et al, 1998) (Aderiotis D, 1999) (Mirković S, 2000.). Besides the presence of saliva, oral cavity is characterised by: local immunogenic response, presence of saprophyte bacteria that can manifest pathogenic effects. Information regarding the behaviour of these suture materials (resorbable and nonresorbable) in the oral cavity, appears incomplete and inconsistent, particularly in humans. Thus this systematic review was done in order to throw more light into these aspects.

**Aim and Objective**

- To analyse the inflammatory response and microbial adherence in intraoral resorbable sutures.
- To analyse the inflammatory response and microbial adherence in intraoral non resorbable sutures.
- To compare the effectiveness of both.

**Pico Analysis**

**P- Population**
Patients undergoing oral surgical procedures

**I- Intervention**
Sutting with resorbable suture biomaterials

**C- Comparison**
Sutting with non resorbable silk sutures

**O- Outcome**
Inflammatory response, Microbial adherence

**MATERIALS AND METHODS**

**Sources used**
An electronic search was conducted for scholarly articles about the inflammatory response and microbial adherence invoked by intraorally placed resorbable and non resorbable silk sutures in pubmed

**Pico Analysis**

**Search methodology**
The search methodology applied was pubmed based, suitable keywords were formulated for the PICO analysis and subjected to advanced search using boolean operator.

**Population**
Oral surgery, Third molar extraction, Dental extraction, Pericoronitis, mesioangular impaction, Distoangular impaction, Horizontal impaction, vertical impaction

**Intervention**
Resorbable sutures, Vicryl sutures, Polygycolic sutures, Polytetrafluoroethylene sutures, Chromic catgut

**Comparison**
Nonresorbable sutures, silk sutures

**Outcome**
Inflammatory response, wound healing, wound closure, microbial adherence

**Selection of Studies**
The review process consist of two phases, In the first phase, titles and abstract of the search were initially screened for relevance and the full text of relevant abstract were obtained and accessed. The articles that were obtained after first step of review process, were screened using exclusion criteria in second phase. In the parent study, the exclusion criteria included studies and researches performed on animals. Relevant and suitable articles were isolated for further processing and data extraction.

**RESULTS**
The database search yielded 12 articles out of which 3 articles were discarded after reading the abstract. Full texts were obtained for the remaining 9 articles. 5 articles were selected based on the inclusion criteria and 4 articles were excluded. The finally selected 5 articles were subjected to data extraction.

**Data Extraction**
The data from the finally included studied were tabulated and the following information were extracted.

- Study design
- Study group
- Method of observation
  - Cellular elements
  - Microbial adherence
- Statistical tests

**Flow Chart for Search Strategy**

**RESULTS**
The following information were extracted and tabulated. The data such as - Name of the author, study design, study group,
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Figure 2 Flow chart for search strategy. The following information were extracted and tabulated.

Method of observation (accumulation of cellular elements, microbial adherence), statistical tests were extracted and tabulated (Table 1).

<table>
<thead>
<tr>
<th>Item</th>
<th>Criteria</th>
<th>Results</th>
<th>Statistical analysis</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Azad and Sajadi (2020)</td>
<td>Non resorbable silk sutures were found to cause inflammatory response between two types of sutures.</td>
<td>Chi-square test</td>
<td>Non resorbable silk sutures seemed to conduct inflammatory response more intensely and more prolonged inflammatory response when compared to other types of sutures.</td>
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<td>2.</td>
<td>Balamurugan et al. (2019)</td>
<td>Non resorbable silk sutures were found to cause more intense and prolonged inflammatory response when compared to other types of sutures.</td>
<td>ANOVA</td>
<td>Non resorbable silk sutures seemed to conduct bacterial migration more easily than the other types of sutures.</td>
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<td>3.</td>
<td>Balamurugan et al. (2019)</td>
<td>Thus, majority of the articles prefer the use of resorbable suture materials for wound closure in oral surgeries.</td>
<td>Fisher’s exact test</td>
<td>Thus, majority of the articles prefer the use of resorbable suture materials for wound closure in oral surgeries.</td>
</tr>
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DISCUSSION

Wound closure by suturing is a critical and significant event in general as well as in oral surgery. In particular, sutures used in oral surgery behave differently from those used in other parts of the body because of the quality of tissues involved.

From the data extracted, the following interpretation can be made.

- For comparison of degree of inflammatory response and microbial adherence between intraorally placed resorbable sutures and intraorally placed non resorbable silk sutures, a meta analysis cannot be done as the obtained articles exhibited significant amount of heterogeneity with respect to method of assessment and outcome parameters. Some reviewers have reported the method of observation in terms of cellular elements accumulation while others have reported based on degree of microbial adherence. Even in Results by people who have reported based on microbial adherence, numerous variations such as isolation of different species of microorganism colonisation can be observed. Some of the researchers have done qualitative instead of quantitative data analysis. As these data could not be categorised into homogenous strata, a meta analysis could not be initiated.

- Non resorbable silk sutures were found to cause more intense and prolonged inflammatory response when compared to other types of sutures.

- Thus, majority of the articles prefer the use of resorbable suture materials for wound closure in oral surgeries.

<table>
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<th>Table 1 Data extraction from included articles</th>
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revealed that inflammatory cells were more prominent in areas surrounding black nonresorbable silk suture and the polyglycolic acid sutures showed less tissue reaction when compared to the former.

The study performed by sortino et al revealed similar findings. However he had reported in detail regarding the absence of pathogenic bacteria and fungi in polyglycolic acid sutures in addition to the previous result that inflammatory reaction was restricted in patients with polyglycolic acid sutures.

Banche et al performed a clinical study with a much larger study group involving comparison between four different suture materials namely silk nonresorbable, nylon, polyester and polyglycolic acid. The findings of this study reveal that the resorbable sutures had the least affinity towards adherence of bacteria, while the greatest quantity of bacteria was found on nonresorbable sutures. It also reported that non absorbable multifilament suture had the maximum accumulation of bacteria.

Lecknes et al through his study demonstrated that nonresorbable silk sutures caused a more extensive inflammatory reaction compared to resorbable Polytetrafluoroethylene sutures and nonresorbable silk sutureseemed to conduct more bacterial migration than the former. Similar results were established in study conducted by abirached et al, (1992) who compared four different types of suture materials, (silk, nylon, polyester, PGA). He concluded that nonresorbable silk sutures caused more intense and prolonged severe inflammatory reactions.

CONCLUSIONS

The findings of all the included articles unanimously indicate that the nonresorbable silk sutures were found to cause more severe and prolonged inflammatory response and more prone to bacterial adherence which acts as hindrance in the process of wound healing when in comparison with intraoral resorbable sutures. Most of the researchers prefer the use of resorbable sutures for wound closure in oral surgeries. Further studies with controlled variables and quantitative outcome measures will enable further understanding and could be a scope for future research.

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