



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

Ilankizhai RJ\*<sup>1</sup> and Dhanraj<sup>2</sup>

Saveetha Dental College and Hospitals, Saveetha University, Chennai -600077

### ARTICLE INFO

#### Article History:

Received 16<sup>th</sup> December, 2016

Received in revised form 24<sup>th</sup> January, 2017

Accepted 4<sup>th</sup> February, 2017

Published online 28<sup>th</sup> March, 2017

#### Key words:

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

### ABSTRACT

**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.

Copyright©2017 Ilankizhai RJ and Dhanraj. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

## 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. (Çapano lu 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 repair 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

\*Corresponding author: Ilankizhai RJ

Saveetha Dental College and Hospitals, Saveetha University, Chennai -600077

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) (Aderriotis D, 1999) (Mirkovi 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**

Suturing with resorbable suture biomaterials

**C-Comparison**

Suturing 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, Polyglycolic sutures, Polytetrafluoroethylene sutures, Chromic catgut

**Comparison**

Nonresorbable sutures, silk sutures

**Outcome**

Inflammatory response, wound healing, wound closure, microbial adherence

Search	Pubmed	Search	Pubmed	Time
452	452	Search (((Oral surgery) OR Third molar extraction) OR Dental extraction) OR Pericoronitis, OR Mesioangular impaction, OR Distoangular impaction OR Horizontal impaction OR Vertical impaction AND ((Inflammatory response) OR Wound healing) OR Microbial adherence OR Wound closure) AND ((Vicryl sutures) OR Silk sutures) AND ((Resorbable sutures) OR Vicryl sutures) OR Polytetrafluoroethylene sutures OR Polyglycolic sutures) OR Chromic catgut	2	04:52:07
453	453	Search ((Inflammatory response) OR Wound Healing) OR Microbial adherence) OR Wound closure	28936	04:52:11
454	454	Search Wound healing	215	04:52:44
455	455	Search Wound closure	215	04:52:47
456	456	Search Wound healing	2026	04:52:50
457	457	Search Inflammatory response	15142	04:52:52
458	458	Search ((Resorbable sutures) OR Vicryl sutures) OR Polytetrafluoroethylene sutures OR Polyglycolic sutures) OR Chromic catgut	3489	04:52:49
459	459	Search Polytetrafluoroethylene sutures	731	04:52:53
460	460	Search ((Resorbable sutures) OR Vicryl sutures) OR Polytetrafluoroethylene sutures OR Polyglycolic sutures) OR Chromic catgut	3109	04:52:54
461	461	Search Chromic catgut	284	04:52:52
462	462	Search Polytetrafluoroethylene sutures	3109	04:52:54
463	463	Search Polyglycolic sutures	286	04:52:53
464	464	Search Vicryl sutures	1322	04:52:53
465	465	Search Resorbable sutures	396	04:52:55
466	466	Search Nonresorbable sutures) OR Silk sutures	32	04:52:58
467	467	Search Silk sutures	88	04:52:54
468	468	Search Nonresorbable sutures	11	04:52:53
469	469	Search (((Oral surgery) OR Third molar extraction) OR Dental extraction) OR Pericoronitis, OR Mesioangular impaction, OR Distoangular impaction) OR	46286	04:52:59

Figure 1 Search history in pubmed

**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,

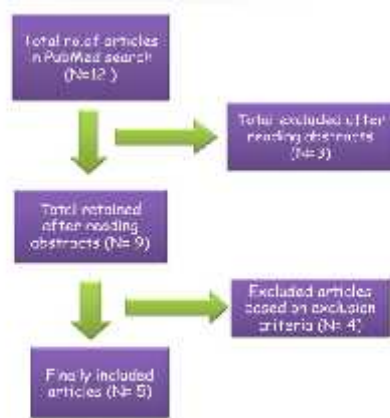


Figure 2 Flow chart for search strategy. The following information were extracted and tabulated

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

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
- Non resorbable silk sutures seemed to conduct bacterial migration more easily than the other types of sutures.
- Thus, majority of the articles prefer the use of resorbable suture materials for wound closure in oral surgeries.

## 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,

S.no	Journal	author	study design	study group	Method of observation Cellular elements, Microbial adherence	Statistics	Inference	
1.	Journal of contemporary dental practice (2011)	Dalwadi et al.	Clinical (uncontrolled)	• Silk • PDS	Inflammatory cells were present in case of nonresorbable sutures	Chi square test p value <0.05	The polymer of silk suture had less tissue reaction than nonresorbable sutures because of bacteriostatic and healing capacity.	
2.	Oral Maxillofacial and oral pathology (2006)	Srinivas et al.	Clinical (noncontrolled)	• Silk • ZPTA	lymphocytes (45%), epithelial cells and neutrophils (35%), desquamated and pyogenic bacteria (10%), monocytes (15%)	Resorbable sutures: high aerobic bacteria: PDS and silk pathogenic bacteria and 1/3 were missing. Silk and PDS same degree of bacterial reaction	Chi square test p value <0.05	The inflammatory reaction was not restricted to pockets with PDS. Despite the presence of some anaerobic and aerobic bacteria (ACTINOMYCES, BACTEROIDES, etc.), pathogenic bacteria was missing in PDS.
3.	Journal of oral and maxillofacial surgery (2007)	Bhaskar et al.	Clinical (controlled RCT)	• Silk (resorbable) • PDS • polypropylene	Silk showed significant affinity towards colonization of bacteria. Microorganisms are multifactorial organisms. Accessible microorganisms in human tissues. Greater quantity of bacteria was found on non resorbable sutures.	Chi square test p value <0.05	Resorbable silk sutures are preferred over silk sutures as they are less prone to bacterial adherence.	
4.	Journal of periodontology (2003)	Lubrod et al.	Clinical (Randomized trial)	• Silk • PDS	Multi-faceted high bacterial adherence. Many factors for bacterial adherence.	ANOVA p value <0.05	Silk suture apparently causes a more extensive inflammatory tissue reaction compared to silk suture. Silk suture seems to conduct bacterial reaction more easily than PDS.	
5.	Oral Maxillofacial (2001)	Abi-Raddad et al.	Clinical (resorbable trial)	• Silk • PDS • polypropylene • PDS	Micro organisms such as aerobic lymphocytes, macrophages and neutrophils.	Chi square test p value <0.05	Silk suture caused more intense and prolonged tissue reactions than the other suture materials. However, changes were not significant.	

Table 1 Data extraction from included articles

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

the constant presence of saliva and functions related to speech, mastication and swallowing.

Good sutures requires specific physical characteristics and properties such as good resistance to traction, dimensional stability and knot security. At the same time, they must limit bacterial adhesion and prevent contamination in wounds and promote wound healing. Information regarding tissue reactions to different suture materials (resorbable and nonresorbable) appears incomplete and inconsistent, particularly in humans. Thus this systematic review was done in order to throw more light into these aspects.

Balamurugan *et al.*, (2012) performed a clinical study which compared the degree of cellular element accumulation or inflammatory response between two different suture materials one being non resorbable silk suture and resorbable polyglycolic acid sutures. The findings from the study

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 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 Polytetraflurorthylene sutures and nonresorbable silk sutures seemed 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.

## References

Abi Rached RS, de Toledo BE, Okamoto T, *et al*. Reaction of the human gingival tissue to different suture materials used in periodontal surgery. *Brazilian Dental Journal*. 1992;2(2):103-113. [PubMed]

- Aderriotis D, Sàndor GK. Outcomes of irradiated polyglactin 910 VicrylRapiDe fast-absorbing suture in oral and scalp wounds. *J Can Dent Assoc* 1999; 65(6): 345–7.
- Banche G, Roana J, Mandras N, *et al*. Microbial adherence on various intraoral suture materials in patients undergoing dental surgery. *Journal of Oral and Maxillofacial Surgery*. 2007;65(8):1503-1507. [PubMed]
- Çapano lu D. Sutures, 1999-2000, Spring Term. [cited 2007. September 9]. Available from: <http://www.biometu.edu.tr/biomed/sutures.htm>
- Dragan Gazivoda *et al*, A clinical study on the influence of suturing material on oral wound healing, *Vojnosanit Pregl* 2015; 72(9): 765–769.
- Leknes KN, Røystrand IT, Selvig KA. Human gingival tissue reactions to silk and expanded polytetrafluoroethylene sutures. *Journal of Periodontology*. 2005;76(1):34-42.[PubMed]
- Mirkovi S. Impact of suture material on wound healing following mucoperiosteal incision. Novi Sad: Faculty of Dentistry, University of Novi Sad; 2000. (Serbian)
- Peterson L, Ellis E, Hupp JR, Tucker MR. Contemporary Oral and Maxillofacial Surgery. 3rd ed. St Louis, Mo: Mosby Year- Book; 1998.
- Racey GL, Wallace WR, Cavalaris CJ, Marquard JV. Comparison of a polyglycolic-poly-lactic acid suture to black silk and plain catgut in human oral tissues. *J Oral Surg* 1978; 36(10): 776–70.
- R Balamurugan *et al*, Clinical and Histological Comparison of Polyglycolic Acid Suture with Black Silk Suture after Minor Oral Surgical Procedure, *The Journal of Contemporary Dental Practice*, July-August 2012;13(4):521-527
- Sortino F, Lombardo C, Sciacca A. Silk and polyglycolic acid in oral surgery: a comparative study. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology and Endodontology*. 2008;105(3):e15-e18. [PubMed]
- Stone IK, von Fraunhofer JA, Masterson BJ. A comparative study of suture materials: chromic gut and chromic gut treated with glycerin. *Am J ObstetGynecol* 1985; 151(8): 1087–93.
- Stone IK. Suture materials. *ClinObstetGynecol* 1988; 31(3): 712–7.

### How to cite this article:

Ilankezhai RJ and Dhanraj (2017) 'Inflammatory Response And Microbial Adherence In Intraoral Resorbable Sutures-A Systematic Review', *International Journal of Current Advanced Research*, 06(03), pp. 2934-2937.  
DOI: <http://dx.doi.org/10.24327/ijcar.2017.2937.0146>

\*\*\*\*\*