IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

# Comparison Of Suture Materials Used In Oral Surgery

1Dr. Vandana shenoy, 2Fathima. K, 3Shivani. S, 4Dr. Mohammed afradh, 5Dr. Gayathri

1Professor, 2CRRI, 3CRRI, 4Reader, 5Professor

1Dr. MGR educational and research institute,

2Dr. MGR educational and research institute,

3Dr. MGR educational and research institute,

4Dr. MGR educational and research institute ,

5Dr. MGR educational and research institute

ABSTRACT:

INTRODUCTION: Sutures are the most frequently used medical device for wound closure. They support tissue during the early phase of healing until it regains its original structure. Primary goal of suture is to re-approximate wound edges under minimal tension leading to haemostasis and promote healing. Clinicians have access to various types of suture materials used in oral surgery. There are wide variety of suture materials available. Each suture materials have distinct features suitable for different oral surgical procedures. Ideal features of suture material include sterility, uniform thickness, flexibility for simple handling and ability to retain knot security and low inflammatory response to promote healing. Suture materials are classified based on their degradability into absorbable and non-absorbable, according to their source into natural or synthetic; their coating into coated or uncoated, dyed or undyed; according to their structure into monofilament or polyfilament. Based on their tissue reaction, tensile strength, mechanical and microbiological resistance, cost effective, bacterial invasion, properties and uses the suture materials are compared.

Key words: “sutures”, “surgical sutures”, “tissue reaction”, “suture inflammation”, “bacterial adhesion”, “tensile strength”, “oral surgery”.

## INTRODUCTION:

Suture is a stitch or series of stitches that is made to secure opposition of the edges of a surgical or traumatic wound. Suture materials is an artificial fibre used to keep wound together until they hold themselves by natural which is synthesized and oven into a stronger scar. Sutures are classified as absorbable or non-absorbable material. They are further sub-divided into synthetic or natural sutures, monofilament or multifilament sutures. The main characteristic of wound closure is to provide good healing and maintain aesthetics of the surgical site [1]. Ideal requisite of a suture materials include sterility, uniform thickness, simple handling, retain knot security and low inflammatory response to promote healing [2]. The conditions present in the oral

cavity, combination of the enzymatic action of saliva, affects suture viability and leads to wound breakdown [3,4,5]

Surgical site infections (SSI) are a major concern. Bacterial biofilms on the suture materials leads to approximately 40% - 60% of Surgical Site Infections [6,7]. Anatomical location, tissue type, wound incision are the features to look into when choosing suture materials [8].

Tensile strength is defined as the ratio of maximum load a suture can withstand without breaking while being stretched to the original cross-sectional area of the given material [9. Tensile strength for a suture material is an important mechanical property and needs to be maintained within the first 2

operative weeks. Sutures with inadequate tensile strength during the healing phase leads to breakage causing poor adaptation. Vicryl loses its tensile strength after 20 days. It has low rate of absorption and present in the oral cavity for a longer time making it unfavourable. Vicryl Rapide are removed by gentle application of gauze or spontaneously after 12-14 days making it a good choice for oral surgical procedures. Yamamoto and colleagues suggest absorbable suture materials than non-absorbable suture materials in oral cancer surgeries for a lower risk of stitch abscess.

## TYPES OF SUTURE MATERIALS:

Suture materials can be broadly classified into absorbable and nonabsorbable; according to their source into natural or synthetic; based on their coating into coated or uncoated, dyed or undyed; according to their structure into monofilament or polyfilament.

1. Absorbable sutures: Absorbable sutures are dissolvable stitches that are made of materials that would disintegrate over time and by dissolving into the skin. These sutures are absorbed due to the Hydrolysis process. Absorbable sutures have both synthetic and natural types. The synthetic types of sutures include polyglycolic acid (PGA), polyglycolide lactic acid (PGLA), polydioxanone (PDO) and polyglycolide caprolactone (PGCL). Whereas the natural types are plain catgut and chromic catgut.
2. Non-absorbable sutures: Non-absorbable sutures are composed of manmade materials which are not metabolizes by the body. The commonly used non-resorbable suture materials are silk, nylon, polyamide (PA), polypropylene (PP), polyester polytetrafluoroethylene (PTFE) and stainless steel [10]

## MATERIALS AND METHODS:

The scoping review is reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Databases searched for literature review included Scopus, Web of Science and PubMed. The search was accomplished using the keywords “sutures”, “oral surgery”, “absorbable”, “coat”, “surgical sutures”. Only article published in English were included.

## SEARCH STRATEGY:

A literature search was conducted in Scopus, Web of Science and PubMed to identify articles that investigated the comparison of the suture materials used in oral surgery. The following search lines were used for each database: (suture materials) OR (comparison of suture materials) OR (coated or uncoated) OR (absorbable or non-absorbable) OR (monofilament suture in oral surgery) OR (antibacterial suture in oral surgery) OR (tensile strength of sutures) OR (microbiological resistance of sutures) OR (absorption rate of sutures) OR (mechanical properties of sutures) OR (soft tissue reaction of sutures).

COMPARISON OF DIFFERENT TYPES OF SUTURE MATERIALS:

| S.NO | SUTURE MATERIALS | TYPE OF SUTURE | BACTERIAL INVASION | ABSORBABILITY RATE | STRUCTURE | TENSILE STRENGTH | TISSUE REACTION | KNOT SECURITY |
|---|---|---|---|---|---|---|---|---|
| 1. | Plain gut | Natural | Low | Absorbable 7-10 days | Monofilament | Moderate, decreases rapidly | High | Less knot security |
| 2. | Chromic gut | Natural | Low | Absorbable 10-21 days | Monofilament | Moderate better than plain | Moderate to high | moderate |
| 3. | Vicryl (polyglactin 910) | Synthetic | High | Absorbable 28-35 days | Braided | High, retains strength longer | Minimal | Excellent knot security |
| 4. | Polyglycolic acid (dexon) | Synthetic | High | Absorbable 21-30 days | Braided | High | Minimal | Good knot security |
| 5. | Monocryl (poliglecaprone) | Synthetic | Very low | Absorbable 90-120 days | Monofilament | High initially, degrades later | Minimal | Smooth, requires secure knot |
| 6. | Silk | Natural | Very high | Non-absorbable | Braided | Moderate | High | Excellent handling |
| 7. | Nylon (ethilon) | Synthetic | Very low | Non-absorbable | Monofilament | High | Low | Poor knot security |
| 8. | Polypropylene (prolene) | Synthetic | Very low | Non-absorbable | Monofilament | High | Very low | Poor knot security |
| 9. | Polyester (ethibond) | Synthetic | High | Non-absorbable | Braided | Very high | Moderate | Good handling |
| 10. | Stainless steel | Synthetic | high | none | Monofilament | Very high | Very low | poor |

DISCUSSIONS:

Suture materials have distinct characteristics which are suited for certain oral surgical procedures. Appropriate sutures require physical characteristics and properties, such as good tensile strength, stability, knot security and sufficient flexibility to avoid damage to the oral tissues [11]. They play a vital role in wound closure which profusely leads to wound healing. In dental clinical practice choosing a suitable suture is very important. Suture materials are broadly classified according to the degradability into absorbable and non-absorbable, according to their source into natural or synthetic, their coating into coated or uncoated, dyed or undyed, according to their structure into monofilament or polyfilament.

Their characteristics can be distinguished based on the bacterial invasion, tensile strength, soft tissue reaction, mechanical properties and microbiological resistance, cost effectiveness and absorption rate. Plain gut, chromic gut, monocryl (poliglecaprone), nylon (ethilon), polypropylene (prolene) shows very low bacterial colonisation which would promote good wound healing. As they are monofilament in structure they show low

adherence of bacteria. Whereas vicryl (polyglactin 910), polyglycolic acid (dexon), silk and polyester (ethibond) are braided and mulifilament in structure shows higher risk of bacterial invasion in the tissues in which they are used [12.

Tensile strength is an important mechanical property and for proper coaptation of the flaps until healing has completed. Plain gut, chromic gut and silk have moderate tensile strength whereas vicryl, polyglycolic acid, monocryl, nylon, polypropylene and polyester shows high tensile strength in which Monocryl is high initially and degrades later. Tissue reaction is reflected through an inflammatory response which develops during 1-7 days after suturing the tissue. Studies have shown, synthetic materials shows superior behaviour to oral tissues in terms of tissue inflammatory reactions compared to non-synthetic suture materials. Based on tissue response, plain gut, chromic gut and silk shows higher tissue reaction. On the other hand, Nylon and polypropylene shows minimal reaction to the tissues. Vicryl, polyglycolic acid, monocryl and polyester have good handling and excellent knot security.

Traditionally, silk is the most used suture material in oral surgery as its inexpensive, but it cannot be considered as "material of choice" in oral surgical procedures [13,14]. Silk shows more prominent inflammatory reaction in tissues, whereas minimal in nylon, polyester, ePTFE, poliglecaprone 25 and PGA [15,16,17]. The perfect time to remove the sutures play an important role in minimizing further infections [18]. To maintain oral hygiene is utmost important in preventing secondary infections [19,20].

CONCLUSION:

The comparative analysis of various suture materials used in Oral surgery revealed significant differences in terms of physical properties, biological response, handling characteristics, and susceptibility to bacterial invasion. Synthetic absorbable sutures show shorter-lasting inflammatory responses, better scar formation, less bacterial invasion than when compared to non-resorbable sutures making them more suitable for tissue healing. Multistranded sutures are highly susceptible to microbial colonization than monofilament sutures. The timely removal of sutures and good oral hygiene maintenance also plays an important role in preventing infections. Different types of suture materials have specific characteristic which is suitable for certain procedures. Due to limited resources, we cannot end to a conclusion.

REFERENCE:

1. Kakoei S, Baghaei F, Dabiri S, Parirokh M, Kakooei S. A comparative in vivo study of tissue reactions to four suturing materials. Iran Endod J. 2010;5(2):69 [PMC free article] [PubMed] [Google Scholar]
2. Srinivasulu K, Dhiraj Kumar N. A review on properties of surgical sutures and applications in medical field. International J Res Eng Technol. 2014;2(2):85-96 [Google Scholar]
3. Asher R et al (2019) Microbial accumulation on different suture materials following oral surgery: a randomized controlled study. Clin Oral Invest 23(2):559-565
4. Yaman D et al (2022) Evaluation of bacterial colonization and clinical properties of different suture material in dentoalveolar surgery. J Oral Maxillofac Surg 80(2):313-326
5. Garapati B, Malaiappan S, Navya PD (2023) Evaluation of the degradation, Microbial colonization, sustainability of Physical and Mechanical Properties of Lycopene Coated suture materials-An InVitro Study. J Popul Ther Clin Pharmacol 30(10):E101-E107
6. Wang ZX et al (2013) Systematic review and meta-analysis of triclosan-coated sutures for the prevention of surgical-site infection. Br J Surg 100(4):465-473
7. Markrygiannis, I.H., Nikolaidis, A.K., Tilaveridis, I.et al. Coated sutures for use in oral surgery: a comprehensive review. Clin Oral Invest 29,109 (2025). Doi org/10.1007/s00784-025-06176-w
8. Javed F, Al-Askar M, Almas K, Romanos GE, Al-Hezaimi k. Tissue reactions to various suture materials used in oral surgical interventions. ISRN Dent.2012:1-6. Doi: 10.5402/2012/762095. [DOI] [PMC free article] [PubMed] [Google Scholar]
9. Mafredini M, Ferrario S, Beratta P, Farronato D, Poli PP. Evaluation of breaking force of different suture materials used in dentistry: an in vitro mechanical comparison. Materials (basel). 2022 jan30;15(3):1082. Doi:10.3390/ma15031082. PMID: 35161027; PMCID: PMC8840186
10. Gebrimedhin Yohannes, (2024), Review on biological properties of suture materials, J. Endocrinology and disorders, 8(2):DOI:10.31579/2640-1045/176

11. Vasanthan, A.; Satheesh, K.; Hoopes, W.; Lucaci, P.; Williams, K.; Rapley, J. comparing suture strengths for clinical applications: A novel in vitro study. J. Periodontal. 2009, 80, 618-624 [Google Scholar] [Crossref]
12. Vandana Pandey, Joyce Sequeira. Comparison of antibacterial coated and noncoated suture in closure of extraction socket: A clinical and microbiological study
13. Lilly G. E., Reaction of oral tissues to suture materials, oral surgery, oral medicine, oral pathology. (1968) 26, no.1, 128-133, 2-s2.0-0014311244 [PubMed] [web of science] [google scholar]
14. Ananthakrishnan N., Rao R. S., and Shivam S., Bacterial adherence to cotton and silk sutures, The National medical journal of India. (1992)5, no. 5, 217-218, 2-s2.0-0026919905. [Google scholar] [PubMed]
15. Lily G. E., Armstrong J. H., Salem J. E., and Cutcher J. L., Reaction of oral tissues to suture materials. Part II, Oral surgery, oral medicine, oral pathology. (1968) 26, no. 4, 592-599, 2-s2.0-0014347607. [PubMed] [Web of Science] [Google Scholar]
16. Lily G. E., Salem J. E., Armstrong J. H., and Cutcher J. L., Reaction of oral tissues to suture materials. Part III, Oral surgery, Oral Medicine, Oral Pathology. (1969) 28, no. 3, 432-438, 2-s2.0-0014574632. [PubMed] [Web of Science] [Google Scholar]
17. Abdullah Faris, Lian Khalid, Mohammed Hashim, Sara Yaghi, Taif Magde, Ward Bouresly, Zaid Hamdoon, Asmaa T Uthman, Hesham Marei, Natheer Al-Rawi: Characteristics of suture materials used in Oral Surgery: Systematic Review. Int Dent J. 2022 Mar 16;72(3):278-287. Doi 10.1016/j.identj.2022.02.005
18. Selvi F et al (2016) Effects of different suture materials on tissue healing. J Istanb Univ Fac Dent 50(1):35-42 [PubMed Central] [Google Scholar]
19. Baygar T et al (2019) Antimicrobial characteristics and biocompatibility of the surgical sutures coated with biosynthesized silver nanoparticles. Bioorg Chem 86:254-258 [PubMed] [Google Scholar]
20. Tabrizi R, Mohajerani A, Bozorgmehr F (2019) Polyglactin 910 suture compared with polyglactin 910 coated with triclosan in dental implant surgery: randomized clinical trial. Int J Oral Maxillofac Surg 48(10):1367-1371.