

Knowledge and awareness of different suture materials used commonly during surgical procedures by dental practitioners of Mumbai and Navi Mumbai

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ABSTRACT

Background: For any successful dental surgery, wound closure is a key element as it promotes favourable and successful healing while reducing complications. The type of suture material used during dental surgery is a very crucial entity that decides the fate of wound closure and thus contributes in the success of a dental surgery to a large extent. Our study provides practical insights into the use of suture materials, some of which show less intra-operative handling and more patient comfort while others promote healing by avoiding unfavourable plaque accumulation, making it directly applicable to your daily practice.

Materials and Methods: A validated self-structured questionnaire consisting of 15 close-ended questions was distributed among the dental practitioners of Mumbai and Navi Mumbai.

Result: The data was collected and compiled into an MS Office Excel worksheet and subjected to statistical analysis using an appropriate package, such as SPSS software. The results were presented as numbers with percentages for the responses.

Conclusion: No suture is superior to the others in each aspect. The differences in tissue reaction and bacterial adhesion between sutures should always be considered in selecting the appropriate suturing material.

Keywords: Alveolar Ridge Preservation, Delayed Implant, Optimized Tooth Replacement.

INTRODUCTION

For the successful outcome of any dental surgery, intimate wound closure and approximation is the key factor that decides the fate of the procedure. There are different parameters on which the success of a dental surgery depends and one such most important parameter is the material of suture. Dental suturing aims to seat and fix surgical flaps so that optimal healing can be witnessed by primary intention. By doing so, tissue margins get the optimum necessary support till healing takes place

along with avoiding any dead space. This aids in reducing postoperative pain as well as scar. Inadequate suturing in surgeries may result in flap skipping, exposed bone / necrosis, pain as well as delayed wound healing³ When we trace back the history of suture and suture materials, it can be found that different kinds of suture materials were employed in the past for close approximation of wounds as well as for the ligation of blood vessels. Earlier there were only few suture materials

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available in the market as suture material thereby limiting the healing and wound approximation post-surgery in those times. But now a days, there are different types of suture materials available in the market offering different properties. In the ancient times, materials like adhesive pastes, metallic wires, stents, tissue tags were used for ligating blood vessels and for giving primary closure to wounds following surgical procedures. But suture material remained the most suitable material in closing wound. In the beginning of 19th century, metal threads were used as the suture materials. Materials like wires and stent showed disadvantages like stiffness, difficulty in knot tying and frequent knot failure along with suppuration, whereas other materials like hemp and goat suture resulted in allergic reactions.³ At the end of 19th century, catgut material gained popularity as the suture material. Later on, different types of materials were introduced as the suture materials. But amidst all these materials, silk suture remained the best choice among practitioners as suture materials as it provided better knot stability and less suppuration and allergic reactions compared to other suture materials available in the market at that time.⁴

Selecting the material of suture is based on the plight of the wound, the tissues to be rehabilitated, the tensile strength and the, knot unwinding characteristics of the suture material along with the reaction of proximal tissues to the suture materials⁵.

Suturing is an important aspect of any dental or surgical procedure where there is either cutting or injury to the soft tissue in the oral cavity⁶ (Taylor and Bayat, 2003). Proper placement of sutures can help in faster and proper healing of the tissues involved⁷ (Trimbos, Van Rijssel and Kloppe, 1986). It helps in primary healing of the wound site and also prevents any secondary infections. It is imperative to keep in mind that choosing the correct type of suture and needle in dentistry is as important as the suturing technique as it helps in properly piercing and also maintaining the integrity of the tissue⁷.

The present study aimed to evaluate the knowledge and awareness of different suture materials used commonly during surgical procedures by dental practitioners of Mumbai and Navi Mumbai. The research holds an objective to determine the

knowledge and awareness of different suturing materials used commonly during surgical procedures by dental practitioners of Mumbai and Navi Mumbai in order to facilitate primary closure of wounds with faster wound healing.

MATERIALS AND METHODS

A cross-sectional study was done by using a questionnaire-based survey over a period of 3 months from February to May 2023. The questionnaire consisted of 15 close-ended and open-ended questions divided into 2 categories of questions in the English language. The questionnaire was formulated using Google Forms. The questionnaire was internally validated by five subject experts from different departments in dentistry. Few corrections were made as required after internal validity for face and content validity to ensure the applicability, suitability and consistency of the questionnaire. The questionnaire study was conducted after approval by the Scientific Review Committee and the Institutional Ethical Committee (BEC731072024) of BVDUDCH, Navi Mumbai. The questionnaire was formulated to measure the knowledge and awareness of dentists in Mumbai and Navi Mumbai. The questionnaire was circulated to the participants with the help of online media platforms such as whatsapp and email. The purpose and design of the study were explained to the participants in detail. When respondents consented to the survey, the demographic data of the participants were documented.

Statistical Analysis

Sample size estimation:

Sample size was determined using the estimates from the parent article Reddy, B. Aishwarya. (2020). Knowledge and Awareness on Various Suturing Techniques Used in Minor Oral Surgeries Among Dental Students. Bioscience Biotechnology Research Communications.¹ 13. 106-111. 10.21786/bbrc/13.7/19. & using a single proportion formula as below

$$n = \frac{1.96^2 p(1-p)(DEFF)}{d^2}$$

Where p = Estimate of the expected proportion

d = Desired level of absolute precision

Assuming the current Knowledge to be atleast 90%.

Keeping 5% confidence limit, for p = 0.05

$$n = \frac{1.96 \times 1.96 (0.90 \times [1 - 0.90])}{0.05 \times 0.05}$$

$$0.05 \times 0.05$$

$$n = 138$$

A total of 138 respondents or above should complete the survey to generalize the results to a larger target population.

III Statistical analysis:

The data collected was compiled into an MS Office Excel worksheet (v 2019, Microsoft Redmond Campus, Redmond, Washington, United States) and subjected to statistical analysis using an appropriate package like SPSS software (SPSS v 26.0, IBM).

A comparison of the frequency of responses with independent variables was made using a chi-square test. For qualitative format, analysis was done after the collection of data. All data were entered into a computer by giving a coding system, proofed for entry errors. Descriptive statistics like frequencies and percentages for categorical data and mean & SD for numerical data have been depicted. For all the statistical tests, $p < 0.05$ was considered to be statistically significant, keeping α error at 5% and β error at 20%, thus giving power to the study as 80%.

* = statistically significant difference ($p < 0.05$)

** = statistically highly significant difference ($p < 0.01$)

= non-significant difference ($p > 0.05$) ... **for all tables**

RESULTS

Different dental practitioners from different fields, such as endodontics, orthodontics, paediatric dentistry, periodontics, and oral surgery, along with undergraduate clinicians, participated in the survey. Among the participants, questions were distributed to 150 dentists out of which 140 dentists took the survey. The response rate was 93.3 % in the present

study. Among the respondents, 66.4 % participants were female and 33.6% participants were male. 49 % of participants were general practitioners, and 51 % were specialists. Questions such as preference of suture material, size and frequency of suture placement were asked.

Results showed that in total, 140 participants completed the survey and when asked about the knowledge based question about which suture material causes less CFU following a dental surgery, 56 participants i.e. 40 % responded with PTFE for having **low CFU** whereas in actual nylon suture is found to have lower CFU^{8,9,10} as shown in figure 1.

When asked about a practice as well as a knowledge based question on suture material causing most the knot failure, 49 participants i.e. 35% responded with PTFE in causing the **most knot failure** in contrast to the actual fact where PGA is found to be most susceptible to the knot unwinding.^{11,12,13}.

When asked about the suture material causing most extensive inflammatory reaction 51 participants i.e. 36.4% responded with silk in causing the most extensive **inflammatory reaction** to which various studies have also concluded the same^{14,15,16,17,18}.

DISCUSSION

58 % of practitioners responded with 1 week for **the time period for** suture removal post-surgery, followed by 28% as 10 days, followed by 13 % as 2 weeks and 1% as greater than 2 weeks. This data was consistent with a study done by Alexander et al. where he concluded that the time required for the suture removal post-surgery is 8-14 days. In another study done by Pirsaut Rodanant 2016 et al., the best time for suture removal following dental surgeries was studied using VAS, and it was concluded that suture removal after 7 days is painless with no swelling reported under normal conditions²⁰. The results of the present study was also consistent with an another study done by Minozzi et al in which he concluded that suture removal should be done in 6 – 10 days. Delaying in suture removal can cause systemic illnesses such as bacteremia which can have oral origins¹⁹. Colonization by pathogens on sutures leads to the recommendation that sutures should be removed as early as possible after surgery is performed, to

eliminate or to limit the reservoir for oral pathogens. This recommendation is also dependent on whether the suture is absorbable or not.

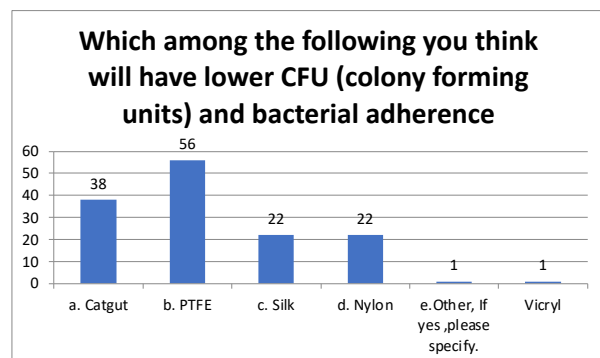


Figure 1. Bar chart showing distribution of CFU in different suture materials . X-axis represents type of suture material and Y-axis represents number of dentists.

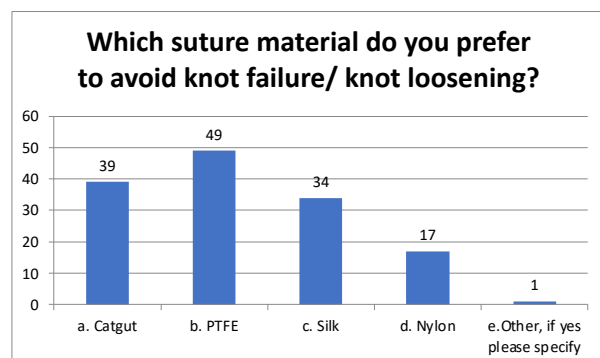


Figure 2. Bar chart showing distribution of knot failure among different suture materials. X-axis represents type of suture material and Y - axis represents number of dentists.

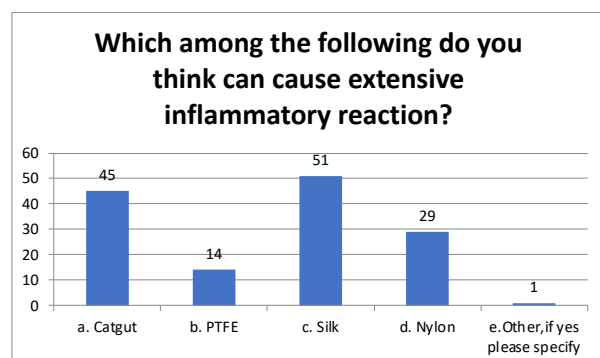


Figure 3. Bar chart showing distribution of inflammatory reaction in different type of suture material. X-axis represents type of suture material and Y-axis represents number of dentists.

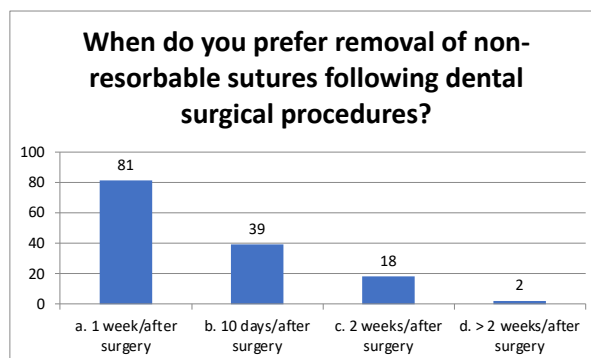


Figure 4. Bar chart showing the distribution of time period of suture removal following dental surgery. X-axis represents the time period of suture removal, and y-axis represents a number of dentists.

When question in the survey was asked about the suture material causing **less CFU** formation, 40 % responded with PTFE in causing low CFU to which many other studies have also concluded the same⁸. In a study done by Stefano Parrini et al 2023, it was concluded that PTFE showed superior properties in the retention of both aerobic and anaerobic micro-organisms⁸. In a similar study conducted by Pons-Vicente et al, comparison of silk and teflon-coated polyester sutures (similar to PTFE) in implant surgery was done and it was found out that plaque accumulation for silk sutures was more pronounced, without a statistical difference¹⁷. In a similar study done by Sortino et al 2007, bacterial contamination was compared between black silk suture and poly-glycolic acid sutures and it was found out that black silk sutures exhibited higher degree of aerobic bacteria¹⁸. In contrast to the above results, in a study conducted by Kim et al, it was found out that Low CFU is found in nylon when compared to other suture materials. Similar to this, in a study done by Asher et al, it was pointed out that nylon causes low CFU accumulation when compared to other suture materials.

49 participants i.e. 35% responded with PTFE in causing the most knot failure whereas PGA is found to be most susceptible to knot unwinding. The result obtained in the present study was contrary to the actual finding. In a study done by Abellan et al 2016, mechanical properties of 5 different sutures were compared by checking the knot configuration. In the study, it was concluded that poly-tetra-fluoroethylene showed the lowest knot failure while the polyglycolic acid showed the most knot failure. It was also concluded that physical conditions such

as pH, thermal cycle process have no influence on the mechanical properties of sutures. In another study done by Sortino et al, it was concluded that PGA is most susceptible to knot unwinding. This result was also consistent with another study done by Asher et al which concluded that among all the sutures present, PGA caused most knot failure.

In the survey, it was found out that 36.4 % participants responded with silk in causing most extensive inflammatory reaction. It was observed that inflammation was less on 3rd day in comparison to 7th day. It was due to infiltration of numerous inflammatory cells into the black braided silk on day 7, while no infiltrated inflammatory cells were observed on day 3. The results revealed that placement of sutures in gingival tissues elicits an inflammatory reaction and that the magnitude of this reaction may vary with the suture material used¹⁴. Braided silk sutures apparently cause a more extensive inflammatory tissue reaction in an environment characterized by moisture and infectious potential. The results were also consistent with a study done by Leskin et al in which he concluded that among all the sutures present, silk suture is found to be most associated with inflammatory reaction characterized by moisture and infectious potential¹⁶. In another study done by Syafida et al, it was concluded that silk suture is responsible for inducing more inflammatory reaction when compared to other sutures¹⁸.

CONCLUSION

This survey has identified important gaps between knowledge and awareness among the dental practitioner about use of suture materials in dental procedures. So a further emphasis is needed to improve awareness among the practitioners. Similar studies on large populations should be done in order to get the relevant results. This study will act as a guide to understand the awareness of various suturing techniques used in minor oral surgeries among dental practitioners. Knowledge of the suture, needles (type, size, shape), instruments, and techniques are absolutely necessary in order to be a competent clinician. There is no suture superior to the others in each aspect. The differences in terms of tissue reaction and bacterial adhesion between sutures should be always considered in the selection of the appropriate

suturing material. Delicate and proper soft tissue handling during various suturing techniques can ensure optimal tissue healing and high aesthetic result²⁰.

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