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Evaluation Of Suture Materials Used For Extraction Wounds In Diabetic Patients - A Retrospective Study

Research Article

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Abstract

Aim of this study was to evaluate the type of suturing material used following extractions in diabetic patients. Most of the oral surgical interventions require primary wound closure by using suture material. Diabetic patients are considered to have increased wound healing problems when it comes to dental extractions. No previous literature compared these two parameters. So in this study we evaluate the usage of different types of suture material used in diabetic patients undergoing tooth extractions. Data of (n = 75) patients who visited an institution is retrieved. Data was analysed on the basis of history of diabetes and underwent extraction procedure that requires suturing was retrieved from institutions patient records. The parameters age, gender, site of extraction, type of suture material used was tabulated. The data was analyzed using SPSS software. Descriptive statistics and chi square test was done. Results of this study showed that traditional silk (n=59) was the material of choice among dentists in wound closure while treating diabetic patients following extraction (78.67%). This study concludes that the silk is the material of choice than the other suture materials for wound closure in diabetic patients visiting the institution. The site of suturing did not influence the choice of suture material.

Keywords: Diabetic; Polyglactin; Silk; Suture Material; Vicryl 4-0.

Introduction

Most of the oral surgical interventions require primary wound closure. This is done using a previously raised flap and with the help of suture materials [1]. Healing of extraction sockets compromises a series of cellular events such as repair and regeneration of the oral tissue. These events are precisely controlled and regulated by specific signalling molecules such as transforming growth factor beta (TGF-β), vascular endothelial growth factor (VEGF), bone morphogenetic protein (BMP), and insulin-like growth factor (IGF), which are well-conserved proteins involved in the initial response to injury and repair in soft and hard tissues. Bleeding both intraoperatively and postoperatively in oral surgery causes a great threat to the patient and can lead to very serious consequences if it's not controlled [2]. Sutures are classified upon their origin as organic and synthetic or according to durability (absorbable and non absorbable [3]. And traditionally diabetes is considered to have increased healing problems related to extractions [4]. Poor glycemic control leads to development of a range of complications such as macrovascular, microvascular and neuropathic which inturn affects the healing of extraction wounds [5]. These can affect the outcome of surgery and results in poor wound healing [6, 7]. Sutures used in oral surgery should avoid or limit bacterial adhesion and proliferation to those parts exposed to oral fluids [8]. The variety of bacteria corresponding with purulent infections, is found around suturing sites that is not related with normal oral flora. Intraindividual comparisons of cfu showed differences in dependence of the patient as described for sub gingivale plaques [9]. At all times, the complete surface of silk sutures was embedded with a thick layer of bacterial plaque and debris. Microorganisms and blood cells on the surface and between the filaments of the silk suture material were observed [10-

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12]. The term "suture" describes any strand of material utilized to ligate blood vessels or approximate tissues. The primary objective of dental suturing is to position and secure surgical flaps in order to promote optimal healing (first / primary intention) provides support for tissue margin until they heal, without showing dead space, cells and reduce postoperative pain. Inadequate suturing may result in flap skipping, exposed bone / necrosis, pain and delayed wound healing [13].

Among the local factors that influence healing after tooth extraction, suture also plays an important role in that process. Suturing of the gingival mucosa helps epithelial regeneration and protects the blood clot in the initial stages of the healing process [14]. On the other side, the suture material employed may also prolong the onset of cell proliferation. Thus the sutures should not be irritating to the tissues, determining a short and mild inflammatory phase of healing [15]. The response of the oral mucosa to suture material [16]. indicate that synthetic materials show superior behavior. Among suture material , polyester threads, both superficial and deep, promote a mild and short inflammatory system. Deep polyester sutures, however, result in a foreign body reaction [17]. A multiple filament, non resorbable sutures has been indicated for delicate flaps [18].

The diabetic population is predicted to increase from 171 million in 2000 to 366 million by 2030. Almost three million deaths (5.2% of all deaths worldwide) per year are attributed to complications from diabetes and a majority (~80%) of these patients are in developing countries [19]. Therefore a special wound closure modality is needed while treating diabetic patients. Bleeding complications can occur in any individual healthy as well as patients with systemic diseases. Having a wider knowledge and awareness of the management approaches will allow the dentists to know when to apply a particular suturing technique. although, some of the most effective preventive measures and management techniques are not utilized because of less understanding of the coagulation process and the techniques and materials that are available [20]. Tissue reaction is reflected through an inflammatory response, which develops during the first two to seven days after suturing the tissue [21, 22]. Surgical site infections (SSI) are the third most common hospital-acquired infections and account for 14% to 16% of all such infections [23]. Diabetes mellitus is one of the major reasons leading to chronic wound healing problems. When diabetic patients develop an ulcer, they are at very high risk for developing complications, including infection and thus leading to amputation. The pathophysiologic relationship between diabetes and impaired healing is very complex literature. Vascular, neuropathic, immune function, and biochemical abnormalities are the contributors of altered tissue repair. Despite treatment of these chronic wounds, and proper management of blood glucose level still their prognosis is quite poor.

Wound repair is a well orchestrated process that includes a series of phases [25]. The essential quality of sutures include 1. Knot safety 2. Stretch capacity 3. Tissue reactivity 4. Wound safety. Besides all surgical techniques the choice of suture material plays an important role in wound healing [1, 3, 16]. Patients with diabetic mellitus (DM) are predisposed to having an increased density of candida growth in the oral cavity [19]. Previously our team has a rich experience in working on various research projects across multiple disciplines [25-39].

Since the choice of the suture material used in oral surgical interventions may play an important role in wound healing. Aim of this study was to evaluate the type of suturing material used following extractions in diabetic patients.

Materials And Methods

Study Design

This study was based on saveetha dental college and hospital (university setting). The case records of 86000 patients visiting Saveetha Dental College were analysed and a total of 75 patients with diabetes and who have undergone extraction were retrieved.

Sampling Technique

This study was based on a non probability convenience sampling. To minimize the sampling bias all the case sheets were reviewed and included.

Ethical Clearance

Ethical clearance was obtained from the research ethical board of the institution prior to the study.

Data Collection And Tabulation:

All the data required was retrieved retrospectively Sample size was estimated to be 75 patients who visited Saveetha dental college between June 2019 to april 2020. Case sheets were analysed for age, gender, extraction teeth, diabetes and no other systemic diseases. In case of doubts or discordance of data, the patients were contacted over the phone to confirm the findings.

Inclusion criteria

- Patients with a history of diabetes.
- Undergone extraction followed by suturing.

Exclusion criteria

- Patients with other systemic conditions.
- Patients undergoing anticoagulation medication.

Statistical Analysis

All the statistics and analysis were done using SPSS software (version 2019). All the descriptive analysis such as mean standard deviation and percentages were used to present the number of male and female subjects and demographic variables. Chi square test was used to establish correlation between categorical variables. P value of 0.05 was set to be statistically significant. The internal validity of the study was established as the data was collected from a verifiable and standardised database. The external validity is established as the data is from a clinical setup which is duplicatable.

Results And Discussion

Out of 75 patients, subjects were found to be in the age range from 20 to 90 years of age. Most of the subject falls under the age range between 40 to 60 years of age. Which is due to diabetes

having the highest prevalence between that age range (Figure I). Male (n=49) and female (n=26) has been found to have undergone tooth extraction and has a history of diabetics (Figure 2). Type of suture materials used: Based on the analysis we found silk (n=59) was used regularly in primary wound closure in diabetic patients in saveetha dental college. Polyglactin (n=10) and vicryl 4-0 was found to be in lesser numbers when compared to traditional silk sutures (Figure 3). Type of the suture material and site of the teeth: On the basis of the chi square test there is no significant difference (p>0.05). Shows silk was widely used irrespective of site. But it also shows that polyglactin, vicryl 4-0 sutures have been used particularly in lower posteriors (Figure 4).

In this study we evaluated 75 individuals out of all the subjects n=49 was found to be male and n=26 was found to be female that shows 65.3 percent was male and 34.7 percent was female. These details were retrieved from saveetha dental college and frequency analysis was done using SPSS software. In this study we also found that the percent of different suture material used in all the subjects. Silk was found to be the highest with 78.7 percent and polyglactin was found to be 13.3 percent and vicryl 4-0 was the least used suture material in diabetic patients with only

Figure 1. Pie chart shows age groups of the subjects. Percentage of subjects were found to be more in the age groups of 40-49 years (sandal colour), 50-59 years (purple colour),60-69 years (yellow colour), This was because subjects of those age groups were more prone to diabetes.

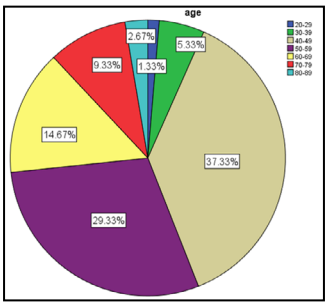


Figure 2. Pie chart shows gender distribution among the subjects. It was inferred that more numbers of male (blue colour) with diabetes were undergoing extraction and needed to be managed by using sutures.

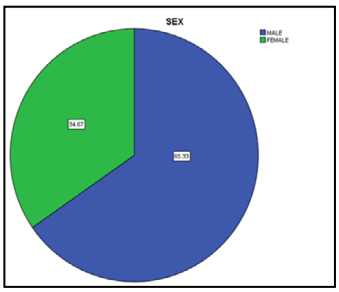


Figure 3. Bar chart shows different types of suture material used in diabetic patients following extraction. X axis represents- type of suture material; Y axis represents- percentage of patients. It was inferred that the diabetes patient when needed suturing management most commonly used material of choice was silk sutures (78.67%, grey colour), and least used suture material was vicryl 4-0 (8%, orange colour).

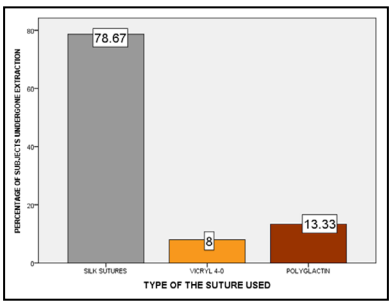
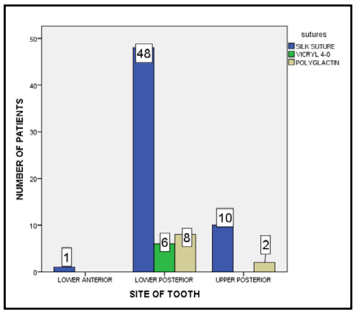


Figure 4. Bar chart shows association between site of tooth and type of suture material used. X axis represents- site of the tooth; Y axis represents- number of patients. It was inferred that irrespective of the site of the tooth the most common type of suture material used in diabetic patients was silk sutures (blue colour, n=59). Vicryl 4-0 (green colour - n=6) and polyglactin (sandal colour, n=8) have been used more while treating lower posteriors. However there was no significant association between the site of tooth and the type of suture material used (Chi square test; p- 0.808 (>0.05) statistically not significant).



8 percent, this may be due to the easy availability of silk suture. Chi square test was done. P value ($p<0.05$) was set to be significant. We found there is no significant association between site and the suture material being used ($p>0.05$). Silk was found to be used in all the sites 78.7 percent. We also found polyglactin in less numbers was only used in lower posteriors due to its easy manipulation.

Establishing non tension primary wound closure of various soft-tissue flaps is paramount for optimal postsurgical wound healing. Surgical treatments that is need of clinical flap manipulation are those used with traditional periodontal therapy, periodontal plastic cosmetic surgery, hard- and soft-tissue regeneration, and the excision of pathologic tissue also require excellence in execution and thorough understanding of the various techniques of surgery, suturing, and the materials currently available to ensure the desired clinical results [40, 41]. Reports of an increased rate of wound complications in patients undergoing extraction with diabetes mellitus may actually show the increased incidence of general surgical complications or metabolic manifestations associated with diabetes mellitus. Factors such as age, obesity, severe malnutrition, and systemic disease and patients with diseases leading to poor haemostasis may contribute to wound infection and delayed healing of wounds especially in the patients with type II diabetes. In addition, hyperglycemia caused by decreased insulin availability and increased resistance to insulin can affect the cellular response to tissue injury [39].

Several suture materials are available for dental surgical procedures. However it is essential to be aware of the nature of suture material, interaction of suture material with oral tissues [42]. Traditionally silk has been mostly used suture material for dental surgical procedures [43]. This is found to be in agreement with our study. This can be due to the fact silk sutures are inexpensive and readily available [44]. But some authors believe that although silk sutures are inexpensive and easy to handle it should not be considered as a material of choice [45, 46]. Recently, Evans used polyglactin sutures in combination with oxycellulose dressing for each extraction socket [47].

In this study we also found that the usage of polyglactin sutures in posterior teeth is in agreement with a previous study [48], in which authors say polyglactin exhibits greater resistance to traction and it is easy to manipulate. This shows the usage of polyglactin in posterior teeth where it is difficult to manipulate sutures [49].

Searching for ideal suture not only implies biological compatibility, but also its clinical behaviour capacity to avoid contamination inside the wound [50, 51]. Previous literature also suggests that there is no need for certain antibiotic prophylaxis in patients with diabetes undergoing suturing post tooth extraction [52]. Our institution is passionate about high quality evidence based research and has excelled in various fields [53-63].

Considering the limitations of the study, there was no follow up after a week and direct patient evaluation was not in this study and in this study we evaluated a particular ethinic group of people in a certain locality. This was found to be the limitations of this study. Studies with large sample size involving a larger group of people from different locality, proper follow up and evaluating post suturing tissue reactions and further in vitro studies for evaluating antimicrobial resistance of a particular suture material should be done.

Conclusion

This study concluded that the silk suture is the material of choice in the wound closure in diabetic patients following extraction. Although several other suture materials like polyglactin and vicryl 4-0 were used, it was found to be in very less number when compared to the traditional silk suture material. The site of suturing did not influence the choice of suture material. Further studies and clinical trials with other suture materials and probing more into its antibacterial property has to be done in future studies.

Authors Contribution

T. Santhosh had contributed to the design of the study, data collection, analysis of data, results tabulation, manuscript preparation. Balakrishna R N had contributed to the design of the study, analysis of data, results, manuscript preparation. Sankari Malaiappan had contributed to the design of the study, manuscript preparation, proofreading of the manuscript.

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