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Evaluation of effect of two suture material on Peri-implant healing – A clinical study

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Abstract

Suture materials play an important role in healing, reconstruction and reassembly of tissues separated by surgical procedure. Aim – the aim of the present study, was to evaluate the effects of two suture materials on peri-implant healing. Materials and Method- In the present study 30 partially edentulous subjects for implant surgery were selected and randomly divided into two groups-group (a) non resorbable silk sutures (n=15) ,and (b) resorbable vicryl rapide sutures (n=15) .Clinical parameters, healing index,visual analogue for pain and visible plaque score were recorded on 14th day. Results- there was no inter-group statistical difference in the clinical parameters i.e. healing index, visual analogue scale for pain and visible plaque index on 14th day. Conclusion- the results of the present study demonstrated that both non resorbable silk suture and resorbable vicryl rapide polyglactin 910 sutures are equally effective for wound closure in implant surgeries and no stastisical difference was seen with these sutures in all parameters taken as both the sutures used were multifilament in nature.

Keywords: Vicryl Rapide, Implant, Visual Analogue Scale, Sutures

Introduction

The surgical procedure for dental implants has shown predictable long-term results. Multiple aspects must be controlled during any surgical procedure to attain

success and suture is one of them. Sutures are important surgical aids for facilitating wound closure and creating an optimal setting for wound healing.

Generally, ideal suture materials should have certain characteristics like biocompatibility, adequate tensile strength, and minimal tissue reaction.[1] Sutures approximate tissue edges to promote healing and limits deep contamination.[2]

Suture materials are generally classified based on [3] - Mechanical properties (tensile strength) Bio absorbable properties (absorbable and non-absorbable sutures) Macrostructure (monofilament and braided sutures).

Various suture materials are now available for use in dental surgery. Silk has been one of the most widely used material for suturing in the field of dentistry. It is nonabsorbable and composed of an organic protein called fibroin.[2] It also has good strength and is flexible. However, silk sutures have certain disadvantages. Being nonabsorbable it must be removed by the clinician, usually 1 week following surgery. Sometimes it also leads to bacterial accumulation which further leads to inflammation around gingival mucosa.[4]

Absorbable sutures of biological origin (e.g., surgical gut, plane and chromic gut) are gradually digested by enzymes in the tissues, whereas resorbable sutures fabricated from synthetic materials such as polyglycolic acid are hydrolysed via the Krebs cycle.[5] Polyglactin 910 is an absorbable suture (Ethicon Norderstedt Gmbh, Germany) and it is a braided co-polymer of glycolic and lactic acid and is surface treated with polyglactin 370 and calcium stearate in which gamma radiation has partially fragmented its structure.

The objective of this study was to evaluate the effects of two suture materials on peri-implant healing.

Materials And Methods

A total of 30 patients were selected from the Outpatient Department of Periodontology, Himachal Institute of Dental Sciences, Paonta Sahib. In each of these 30 patients 2 different suture materials were used (i)Silk (Non resorbable suture) 3-0 braided suture with 3/8 circle reverse cutting needle was used and (ii) vicryl rapide resorbable suture 3-0 which is braided coated poly (Glycolide Co-L-Lactide) polyglactin 910 and 3/8 circle reverse cutting was used of standard length were randomly placed using different suturing technique following implant surgery. Inclusion criteria for this included systemically healthy patients of both genders with partial edentulism indicated for implant rehabilitation, all subjects should have no periodontal disease and good oral hygiene, non-contributing medical history and patients who are non-smokers. Patients were recalled on the 14th day, to examine the status of wound area and record all the parameters.

The healing was compared between both the sutures using the healing index by Landry et al[(6)], the Visual Analogue scale for pain was assessed using the numeric rating scale by Scott and Huskisson et al[(7)] and the visible plaque index was used for assessing the plaque on sutures given by Ainamo and Bay[(8)] on 14th day post operatively. Mann-Whitney U test was used for

Results

The mean comparison of healing index between two sutures materials ie group 1 non-resorbable silk sutures (Mean=3.40±0.50, Mean Rank=16) and group 2 resorbable vicryl rapide sutures (Mean=3.33±0.48, Mean Rank=15) were not significantly different (U=105, Z=-0.372, P=0.710).(Table 1)

The mean comparison of visual analogue scale scores between the two-suture group 1 non-resorbable silk sutures (Mean=2.69±0.67, Mean Rank=16.93) and group

2 resorbable vicryl rapide sutures (Mean=2.46±0.72, Mean Rank=14.07) were not significantly different. (U=91, Z=-0.897, P=0.369). (Table 2)

The mean comparison of visible plaque index scores between the two suture types group 1 non-resorbable silk sutures (Mean=0.66±0.48, Mean Rank=14.50) and group 2 resorbable sutures (Mean=0.80±0.41, Mean Rank=16.50) were not significantly different (U=97.5, Z=-0.812, P=0.417. (Table 3)

Discussion

Dental implants have been deemed as one of the most promising disciplines in dentistry and are amongst the most researched topics of our field. They are considered to be an important contribution to dentistry as they have revolutionized the way by which missing teeth are replaced with a high success rate. Today a wide variety of implant systems are available depending on the shape, size, surface topography and coatings, each with its own advantages and limitations.

Sutures are of great importance in implant surgery to avoid wound rupture and communication between implants and the oral cavity during the healing period. Mostly sutures used in implant surgeries are either resorbable Vicryl Rapide polyglactin 910 or non-resorbable Silk sutures. In Branemark implant studies non-resorbable silk sutures had been indicated for approximation of the flaps.[9]. However, in some studies it is shown that non resorbable silk sutures promotes bacterial accumulation.

Vicryl rapide resorbable sutures is commonly used material in implant surgery, as it does not allow adherence of plaque and is well suited for handling. But in some studies, it has been shown that there is high incidence of wound dehiscence with vicryl rapide resorbable sutures as compared to non- resorbable silk suture.[4]

This study was conducted to evaluate the effects of non-absorbable silk sutures and resorbable Vicryl Rapide polyglactin 910 on peri implant healing and document its findings. In the present study, a total of 30 subjects were taken and were divided into two groups randomly. In this study conventional implant placement was done in fully healed edentulous span and then sutures were placed.

Patients who were willing to comply with all the study related procedures signed the informed consent form. The patients with good oral hygiene, non-smokers and healthy patients with no underlying history of systemic diseases or condition were included in the study. All the patients with poor oral hygiene, acute or chronic systemic disorders, pathological changes in the receptor site (tumour, cyst etc), pregnancy and lactating women were excluded from this study as all these conditions may alter the normal periodontal health and hamper the wound healing process.

The subjects were divided into two groups Group 1 (n=15) flap was closed with non-resorbable silk sutures and Group 2 (n=15) where flap was closed with resorbable Vicryl Rapide polyglactin 910 sutures. The inspiration behind this study was drawn from Carl-Johan Ivanoff et al in 2001.[9]

In group 1 non -resorbable Silk suture is used. It is a multifilament suture of organic origin.

According to study done by Altman et al in 2003,[10] it is observed that silk has easy handling characteristics, and a minimum propensity to tear through tissue. According to Kim et al 2007[9] the tensile load decreased for all sutures except silk, so he concluded that monofilament absorbable sutures have a higher knot slippage incidence. Braided silk is characterized by high resistance to tearing forces. However, in the human body, silk sutures may lead to foreign body reactions.

Because of their straightforward handling properties and the ability to apply a silk suture at the appropriate tension, this material is still used despite its limited tissue compatibility features. Silk sutures are also prone to colonization by biofilms. In a study done by Rino Burkhardt et al 2000[11], he said that silk should not be applied for prolonged periods of time.

In group 2 resorbable suture VICRYL RAPIDE Polyglactin 910 is used.

Vicryl Rapide" (Ethicon Norderstedt GmbH, Norderstedt, Germany) is a form of polyglactin 910 in which gamma-irradiation has partially fragmented its structure. Irradiated polyglactin 910 has an initial strength comparable to silk. It loses half its strength in 1 week and has no perceptible strength after 2 weeks. The sutures totally disintegrate within 20 days. Irradiated polyglactin 910 is considered to be a useful suture material both intra- and extra orally. (Carl-Johan Ivan off et al 2000).

The parameters which were evaluated in this study were healing index, visual analogue scale of pain (VAS) and visual plaque score and they were assessed after 14 days.

Healing index Table 1 shows the comparison of healing index between the two sutures i.e., silk and polyglactin 910. Statistical analysis showed that the healing index score for resorbable sutures (Mean=3.33±0.48, Mean Rank=15) and non-resorbable sutures (Mean=3.40±0.50, Mean Rank=16) were not significantly different (U=105, Z=-0.372, P=0.710).

According to study done by Ran Asher et al in 2018[12] they find that Polyfilament sutures also showed higher numbers of bacteria residing inside the tissue. Since in our study both the sutures that were used were multifilament so they harbour same amount of bacteria that lead to same tissue reaction and hence healing will be similar for both the sutures that explain our non-significant results between two groups. According to a study done by Carl johan Ivanoff et al 2001[9] who found that there was no significant difference in healing of silk and vicryl rapide suture but there are little more chance of wound dehiscence with polyglactin suture but in our present study no such dehiscence was observed. In another study which was done by Lanka Mahesh et al 2019[13] observed braided sutures, provide a larger and more complex surface for bacterial adherence than monofilament sutures, facilitating the entrapment of bacteria and thus increasing the risk of contamination.

Visual Analogue Scale (VAS) Comparison of visual analogue scale scores between the two suture types is shown in Table 2. Statistical analysis showed that the visual analogue scale scores for resorbable sutures (Mean=2.46±0.72, Mean Rank=14.07) and non-resorbable sutures (Mean=2.69±0.67, Mean Rank=16.93) were not significantly different (U=91, Z=-0.897, P=0.369). As both the sutures are multifilament, and it is seen that multifilament sutures generally have greater tensile strength, better pliability and flexibility than monofilament suture.

Due to this, there was slight or no pain on the day of suture removal on 14th day for both the sutures taken in the study. Similar results were seen in a study done by Pirasut Rodanant et al 2016[14] in which it is seen that there was no significant difference in VAS score on removal of silk suture on 7th day. In our study it was observed that patients did not have any discomfort on 14th day of suture placement and also in preceding days as the range of VAS for pain for all patients was mild i.e., between 0.1- 3.0.

Visible Plaque Score The comparison of visible plaque index scores between the two suture types were done as seen in Table 3. Statistical analysis showed that the visible plaque index scores for resorbable sutures

(Mean=0.80±0.41, Mean Rank=16.50) and non-resorbable sutures (Mean=0.66±0.48, Mean Rank=14.50) were not significantly different (U=97.5, Z=-0.812, P=0.417). Suture materials with varied physical configuration and chemical structures are important for bacterial adhesion. Since in our present study both the sutures were braided in nature and also multifilament, so they gathered similar amount of plaque. Hence no statistical difference was there in the amount of plaque gathered on both the sutures on 14th day.

A similar study was done by Ran Asher et al in 2018,[12] which showed that multifilament absorbable braided sutures have higher bacterial counts compared to monofilament non-resorbable sutures. But in our study since both were multifilament sutures although one resorbable and other non-resorbable, the visible plaque gathered on both the sutures was similar

In our present study it can be concluded that both non resorbable silk suture and resorbable vicryl rapide polyglactin 910 sutures are equally effective for wound closure in implant surgeries.

Conclusion

Within the limitations of study, the following conclusion can be drawn:

1.Both the non-resorbable silk suture and resorbable vicryl rapide polyglactin 910 resorbable suture showed non-significant results in healing index

2. Both the non-resorbable silk suture and resorbable vicryl rapide polyglactin 910 resorbable suture showed non-significant results in visual analogue scale.

3. Both the non-resorbable silk suture and resorbable vicryl rapide polyglactin 910 resorbable suture showed non-significant results in visual plaque index.

In this study it can be concluded that both non resorbable silk suture and resorbable vicryl rapide polyglactin 910 sutures are equally effective for wound closure in implant surgeries. Although at the start of our study it was speculated that there will be difference in various parameters between two sutures gro ups as one was resorbable suture and the other one was non resorbable suture but as we went along the course of our study it was seen that both sutures have non-significant results for all the parameters when assessed clinically. Further studies between monofilament and multifilament sutures are required in future as no changes were seen with multifilament suture either they were resorbable or non-resorbable since they accumulate same amount of plaque.

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Legend Tables

Table 1: Comparison of healing index between two suture types

	Suture Type	N	Mean	Std. Deviation	P value
Healing Index	Non-Resorbable (Group 1)	15	3.4000	.50709	0.710
	Resorbable (Group 2)	15	3.3333	.48795	

Table 2: Comparison of visual analogue scale between two suture types.

	Suture Type	N	Mean	Std. Deviation	P value
Visual Analogue Scale	Non-Resorbable (Group 1)	15	2.6933	.67556	0.369
	Resorbable (Group 2)	15	2.4600	.71992	

Table 3: Comparison of visible plaque index between two suture types.

	Suture Type	N	Mean	Std. Deviation	P value
Visible Plaque Index	Non-Resorbable (Group 1)	15	.6667	.48795	0.417
	Resorbable (Group 2)	15	.8000	.41404	