

Effect of different suture material on wound healing: A clinical study

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Citation of this Article: Dr. Pooja Prajapati, Dr. Neeta Bhavsar, “Effect of different suture material on wound healing: A clinical study”, IJDSIR- July - 2021, Vol. – 4, Issue - 4, P. No. 104 – 108.

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Type of Publication: Clinical Research Article

Conflicts of Interest: Nil

Introduction

A suture is an artificial strand of material placed across the wound until temporary fibrin strands are formed. Sutures temporarily approximate the tissues during healing of wounds helps in promoting primary healing, and haemostasis. Sutures placed in the oral microbiome act differently than those in the other parts because of the difference in the quality of tissues involved plus presence of saliva, high vascularity, and functions and parafunction of oral cavity.¹ Specific handling characteristics and properties such as knot safety, stretch capacity, tissue reactivity, and wound safety. Multiple suture materials are available and classified according to their properties like filament type (i.e., monofilament & multifilament), diameter & restorability. Suture materials that have been frequently investigated in terms of tissue reactions include cotton, braided silk, polyester, nylon, and cat gut; however, the study outcomes remain debatable.²

To avoid contamination inside the wound sutures must avoid or limit bacterial contamination to the parts which

are exposed to the oral environment. Incisional wound infections are still one of the most severe complications occurring post surgically. Reducing the post-operative soft debris and thus biofilm formation is even more important after regenerative periodontal surgery as it leads to soft tissue dehiscence and membrane exfoliation, rendering regenerative surgery a failure and also aesthetically disappointing results in mucogingival surgery, so it is generally recommended that only optimum amount of sutures necessary to secure the flap as both the suture and the knot itself cause inflammation and delays wound healing.³ Tissue reaction is reflected through an inflammatory response which occurs in first two to seven days after suturing the tissue.⁴⁻⁶

It is essential to be aware of the nature of the suture material, the biologic processes of healing, and the interaction of the suture material with the surrounding tissues. Since the choice of the suture material used in oral surgical interventions may play a role in optimal postsurgical wound healing, the present study aimed to

review the tissue reactions to the various suture materials used in oral surgical interventions.

Subjects and Methods

21 systemically healthy patients aged around 25-55 years requiring full mouth periodontal surgery visiting the outpatient department of Department of Periodontics, Government dental college & hospital, Ahmedabad were selected. In each of these 21 patients 1 of 3 different suture materials 3-0 (7silk, 7vicryl & 7Polyamide) of standard length were placed using figure of eight suturing technique following periodontal flap surgery. Data was obtained by determining the Total Colony Forming Units of bacteria on the 3 different suture materials. Sutures were removed 7 days post-operatively under sterile conditions & according to standard procedures, immediately transferred into a sterile container containing Nutrient agar plate and transferred to laboratory within 1 hr. for the analysis of bacterial Colony Forming Units. Patients were followed-up on the days 7th, 14th and 28th postoperatively and were evaluated clinically for following factors a) incidence of wound dehiscence by Wachtel et al., 2003 (postoperative days 7th, 14th and 28th)⁷; and b) occurrence of local tissue reaction by G. L. Mouzas and A. Yeadon (postoperative days 7th, 14th and 28th)⁸.

Patients were monitored for the presence (/absence) and incidence of post-operative complications such as edema, hematoma, infection, as well as administration of analgesic or antibiotics. Changes of protruding for more than 1 cm relative to the opposite side were registered as edema, and changes of mucosa color to purple were considered as hematoma. Particular attention was paid to the presence of dehiscence and local reaction (redness of the mucosa, edema, inflammation) for all the three types of suture materials.

Results

Table 1 shows number of patients with dehiscence on 7th, 14th and 28th days.

Table 2 shows local tissue reaction after suture (with silk/Vicryl/Nylon) on 7th post-operative day.

Table 3 shows total number of patients with local tissue reaction.

Table 4 shows number of microbial colony formed on inoculation on 7th post-operative day.

The statistical analysis was done with Friedman test.

Table 1

Number of patient with dehiscence	On 7 TH day	On 14th day	On 28 TH day
Silk (n=7)	1 (14.3%)	1 (14.3%)	0
Vicryl (n=7)	0	0	0
Nylon (n=7)	0	0	0

Table 2

Local tissue reaction after suturing with tested suturing material on 7 th post-operative day				
	Silk	Vicryl	Nylon	P value
Gingival color not changed	0	3	4	0.044 (S)
Gingival redness	2	4	1	
Gingival redness with edema	5	0	0	
Gingival redness with subjective symptoms	1	0	2	

Table 3

Number of patients with local tissue reaction	7 th day	14 th day	28 th day
Silk (n=7)	7 (100%)	4 (57.1%)	0
Vicryl (n=7)	4 (57.1%)	2 (28.6%)	0
Nylon (n=7)	3 (42.9%)	1 (14.3%)	0

Table 4

	<50 bacterial colony	50-200 bacterial colony	>200 bacterial colony	P value
Silk	1	0	6	0.028 (S)
Vicryl	3	3	1	
Nylon	4	1	2	

Discussion

The selection for the best suture is specifically related to the procedure that has to be undertaken. This is a critical issue because the periodontal surgeon must ensure that a suture will retain its strength until the tissues of the previously raised surgical flaps recover sufficient strength to keep the wound edges together.

In areas where sutures with higher tensile strength required such as nasal and oral mucosa, the suture of choice is synthetic multifilament suture, whereas monofilament sutures are preferred in areas demanding lower tensile strength.⁹

In present study least local tissue reaction noted in nylon group with statistical significance ($p < 0.05$). While maximum wound dehiscence noted in silk group with 14.3%. Here other factors to be considered is the

compatibility of the suture with healing tissue and also patient's compliance in terms of oral hygiene maintenance and post-operative care. Also, suture should allow minimize microbial load surrounding healing tissue. This both factors ultimately lead to less bacterial contamination and accelerated healing.¹⁰

Durdey and Bucknall revealed Monofilament sutures accumulate lesser quantity of microorganisms as compared to Multifilament sutures.¹¹

Multifilament suture preferred over monofilament due to ease of manipulation, better knot security and also lack of sharp margin that itself can cause injury to the flap while suturing or healing tissue. Even though silk is inexpensive and easy to handle as wicking property of multifilament suture has been studied by many examiners which may lead to ingress of bacteria deeper into the wound lead to contamination.¹²

After any periodontal surgical procedure biofilm develops around the suture material, this microbe produces inflammation and erythema surrounding the healing tissue which is said to be the result of wicking of sutures. The swelling may open up the space between the suture fibrils and interstitial spaces lead to enhance the capillarity of the suture material may lead to more chances of contaminating the wound.¹³

The effect of use different suture material on the wound healing was investigated by measuring local tissue erythema and wound dehiscence. The sutures were removed on the 7th day of surgical procedure and inoculated on nutrient agar plate and microbial colony counted to assess the microbial load on each suture material.

Otten et al in his recent finding revealed that suture removal can cause bacteremia which can be implicated as a possible risk factor for bacterial induced endocarditis.

Hence, suture removal at the earliest (6-10 days) is suggested post oral and periodontal surgery.¹⁴

No patient showed any sign of infection at the time of suture removal. From the microbial load assessment nylon found to be least adherent for the bacterial colony with statistical significance(<0.05). Similar way silk seems to accumulate more number of microbes due to its inherent wicking nature.

In contrast to the present study results, **Grigg TR and colleagues** in a study conducted to demonstrate of the mechanism of wicking and to develop mechanisms and strategies to minimize the transmission of bacteria by fluid movement and bacterial colonization and expansion found that silk suture has least fluid movement by capillarity as compared to other braided suture materials.¹³

Local tissue reaction was found to be more with Vicryl sutures compared to other two (silk, nylon). This probably due to resorbable multifilament material like Vicryl can be digested by some bacteria which can lead to addition in the local tissue reaction. All the three group (silk, vicryl and nylon) showed improvement in healing with time.

Smit et al. in a demonstration in reaction of tissues to various suture materials used in the abdominal facial layer of rats, concluded that, at 7th day post surgery the factor of utmost importance responsible for variation in the reaction of tissues is tissue manipulation and handling during surgery, rather than just the type of suture materials.” Hence, minimal surgical trauma, and minimal, delicate and precise tissue handling should be the most important factor to achieve uneventful and physiological wound healing.¹²

Although similar findings can be applied on periodontal surgery as well but, the saliva and huge amount of bacterial load with inability to completely isolate and immobilize the surgical wound lead to clinical complication and prolonged tissue response to the

continuous influx of microbes along or through the suture channel.¹⁰

These factors become more important in case of periodontal regenerative procedure as accumulation of bacteria and local tissue reaction can lead to compromised results. Similar is true for the mucogingival surgeries as bacterial accumulation is one of the causes of the gingival recession and can lead to arbitrated or unesthetic surgical outcomes as well.³References:

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