Invitro Analysis of the Influence of Myricetin and Nicotine on Absorbable Sutures

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Abstract

Objective: Following dental extractions, biopsies, or other oral surgical operations, sutures are frequently used to seal wounds. Fast-absorbing suture is typically preferred to prevent the need for removal. The goal of the study is to evaluate the effects of secondary metabolites mainly present in foods on the properties of the suture materials (PGA and Vicryl) used in the oral cavity

Material and method: Myricetin extract is prepared using guava leaves and nicotine was collected from tobacco by means of ethanolic extract and mixed together.The effects of both extracts on PGA and Vicryl, the sample sutures utilised in this study, were examined individually in two test tubes.

Results: The antioxidant activity clearly indicates that the combined effect drastically decreases and the anti-inflammatory activity of myricetin nicotine combination the same as myricetin . Results are indicating that the coating decreases the mechanical property of the PGA and vicryl whereas the degradation study shows that this coated material influences the degradation by means of increasing the strength slightly over time in vicryl suture and decreases in PGA.

Conclusion: Consumption of foods containing myricetin and the habit history of tobacco consumption that has nicotine affects absorbable sutures in the oral cavity. Hence those consumption of foods and smoking should be avoided till the healing has taken place .

Keywords: Secondary metabolites, Myricetin, Nicotine, PGA, Vicryl.

1. Introduction

The rigidity of Absorbable Sutures lasts for however long the needed healing time is predicted to last. They are degraded by the tissue digestion through proteolytic enzymatic disintegration until they are completely disintegrated in accordance with the increasing tissue strength[1,2]. Absorbable sutures are excellent for internal wounds and are frequently used in dentistry when sutures are needed for OGS and impaction treatments because it takes a lot of effort and time to remove them, as well as often for comfort.

Due to the widespread use of suturing in dentistry, The absorbable sutures PGA and Vicryl were chosen in this study. One of the first synthetic absorbable sutures to be created was the sterile, absorbable Polyglycolic Acid Suture in the early 1970s[3,4]. PGA Sutures are 100% homo-polymer glycolide-based polymers that are braided and coated.Vicryl is a synthetic, typically braided, absorbable suture.There is also a monofilament variation available [5,6]. It is recommended for soft tissue ligation and approximation[7]. The suture is totally dissolved by acid hydrolysis within 56 to 70 days and retains its tensile strength in tissue for two to three weeks.[8].

One of the principal components of many foods and beverages used by humans, such as fruits, teas, and vegetables, is myricetin, which is mostly known for its anti-inflammatory and antioxidant qualities[9]. A poly phenolic chemical belonging to the flavonoid class is myricetin[10]. Vegetables like tomatoes, fruits like oranges, nuts, berries, teas, and red wine are examples of common dietary sources.Flavonoids have been shown to have inhibitory, therapeutic, anticancer, anti-diabetic, and antibacterial properties. One of the main factors contributing to possibly avoidable morbidity and mortality worldwide is tobacco smoking. Approximately 28.6% of people use cigarettes[11]. The tiny blood vessels that ordinarily deliver oxygen, nutrition, and healing agents to your damaged area get narrowed by nicotine. This delays recovery and can make your pain last longer[12].

This research aims to evaluate the effects of secondary metabolites(myricetin,nicotine) mainly present in daily consuming foods such as guava and habit history of Indians commonly on the properties of the suture materials (PGA and Vicryl) used in the oral cavity

2. Material and Method

Artificial saliva preparation

100ml of artificial saliva was prepared by the mixture of 8.035g of sodium chloride,0.355gbof sodium bicarbonate, 0.0225 of potassium chloride,0.231g of potassium hydrogen phosphate,0.311g of magnesium chloride, 40ml of 1.0M hydrochloric acid ,0.292g of calcium chloride,0.072g of sodium sulphate,6.118g of Trizma base and IM hydrochloric acid,the prepared saliva was divided into 2 separate beakers of 500 ml with 7.4ph and 500ml with 4.4ph.

Preparation of extract and coating on suture:

Guava leaves are used to make myricetin extract, which is then combined with nicotine that was derived from tobacco using ethanolicextract.The effects of both extracts on PGA and Vicryl, the sample sutures utilised in this investigation, were examined individually in two test tubes.

Vicryl and PGA (polyglycolic acid) were divided into six pieces, three of which were 1.5 mm and three of which were 10 mm, respectively.These items were submerged for six hours in

the respective extracts, and then they were allowed to air dry.The tensile strength and the antioxidant and anti-inflammatory effects of nicotine and myricetin on these absorbable sutures, respectively, were tested using threads measuring I0 cm and 1.5 cm

Analysis

Anti inflammatoryactivity , Antioxidant activity ,Tensile strength testing and SEM analysis of surface roughness has been checked.

3. Results

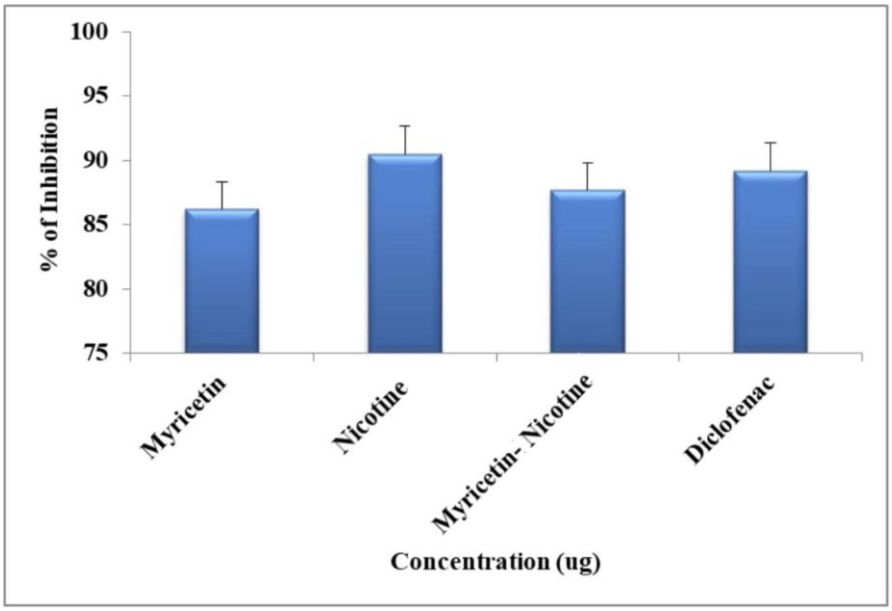


Figure:1. Anti-Inflammatory (Protein Denaturation Assay)

Myricetin, nicotine, and its combination's anti-inflammatory properties in comparison to Diclofenac. The amount of anti-inflammatory activity is not much pronounced in the myricetin group compared with the nicotine group. Combining these together nicotine influences the myricetin, anti anti-inflammatory property which is similar to that of myricetin. Here, we used dichlorophenol for anti-inflammatory .It clearly indicates that the combined effect is the same as Myricetin anti-inflammatory properties.

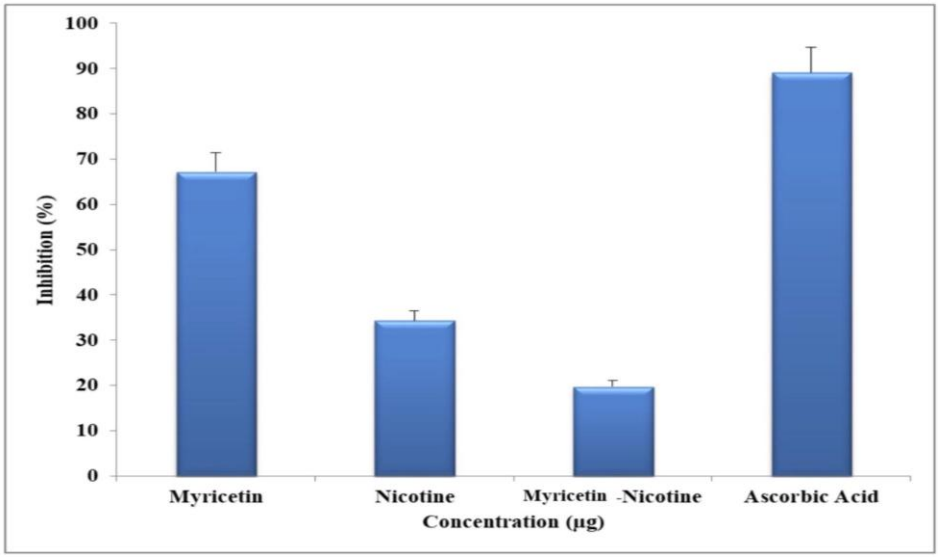


Figure:2. Anti-Oxidant Assay (DPPH Assay)

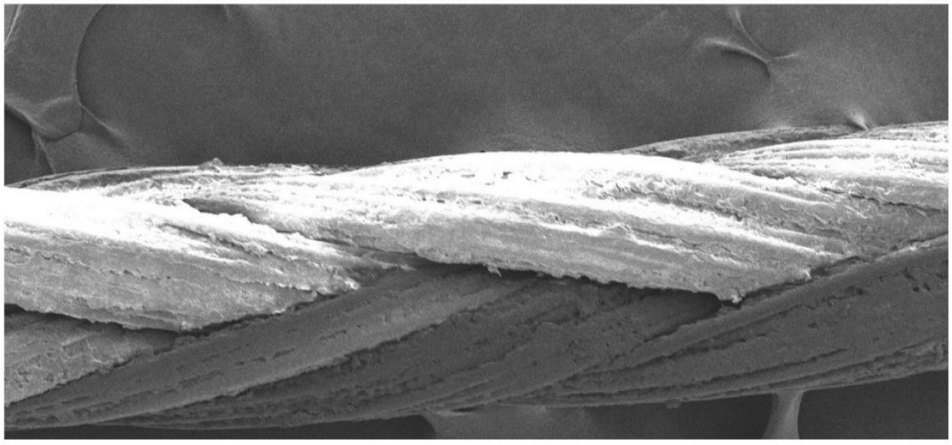
Myricetin, nicotine, and its combination's antioxidant properties in comparison to Ascorbic acid. From the results, the antioxidant property of myricetin is stronger than the nicotine group. Adding that together nicotine reduces the activity of myricetin. Both the groups are compared with clinically proven drugs. Here, for antioxidants we used Ascorbic acid. It clearly indicates that the combined effect drastically decreases the antioxidant properties.

Table-1: Tensile strength testing

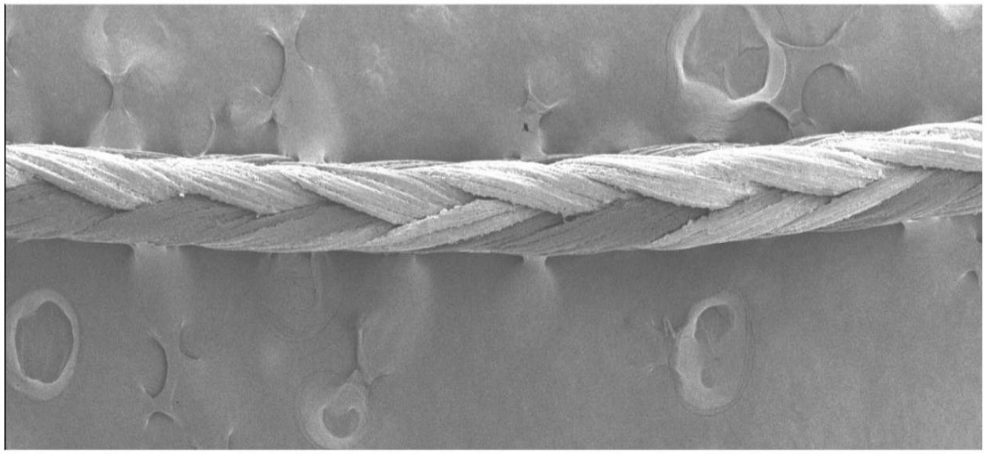
S.NO	SPECIMEN LABEL	TENSILE STRESS AT BREAK(STANDARD)[MPa]
1	**PGA**	**927.31**
2	**Vicryl**	**779.99**
3	**Vicryl 4.4**	**880.51**
4	**Vicryl 7.2**	**958.83**
5	**PGA 4.4**	**736.24**
6	**PGA 7.2**	**652.31**

In terms of mechanical strength the results indicate that the coating improves the mechanical property of the PGA(Polyglycolic acid) and vicryl whereas the degradation study shows that coated material influences the degradation by means of decresing the strength over time. The Tensile test for control groups in PGA is showing around 1279 whereas the coated groups are showing 927 which shows slight decrease in tensile strength which is similar in vicryl as well . Hence, coating reduces the tensile strength. Then, we kept the sutures under the artificial saliva solution at two different pH 7.2 and 4.4. Which reflects 4.4 for the pedo patient whereas 7.2 for the adult patient. The degradation profile shows that after 7days of immersion in the two different pH the 4.4 in the vicryl group increased tensile strength is noticed. Vicryl group at 7.2 which is more than the day 0 value whereas the PGA value is less than the day 0 value. We are using an immersion method of dip coating. So, the materials are immersed in the alkaloids and flavonoids solution. Here, we used 25mg/ml of alkaloids and 75mg/ml of flavonoids

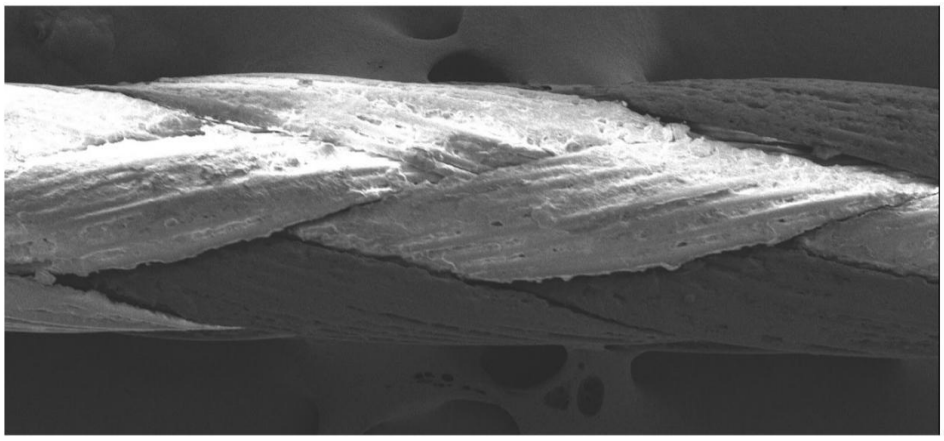
Control PGA



Coated PGA



Control vicryl



Coated vicryl

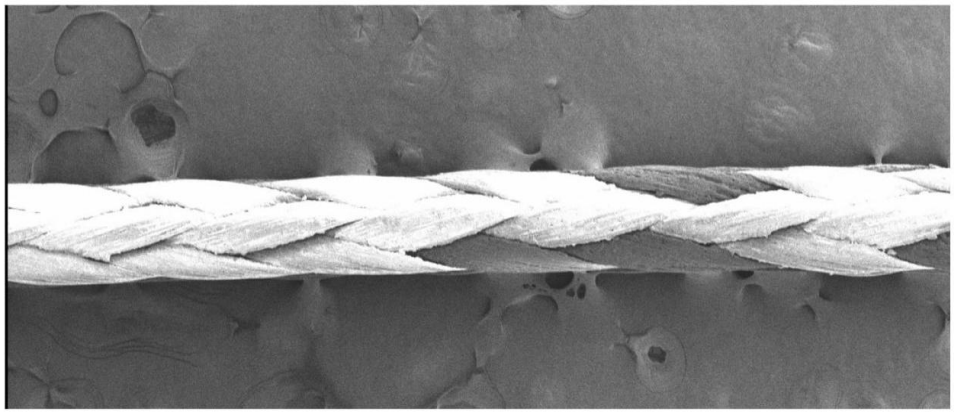


Figure-3:SEM analysis

The SEM images confirm that the coating has been done uniformly. The scanning electron microscopy shows the images of control and coated groups . The control group shows a symmetrical clear picture whereas the coated one shows similar pictures with the added film layer on the top of it . We can clearly see that PGA as well as Vicryl thickness is increased.

4. Discussion

When wounds are healing, synthetic absorbable sutures offer temporary and mechanical support. Additionally, they can serve as supports for soft tissue so that it can restore strength while the tissue heals on its own. At the conclusion of their individual soaking periods, all sutures were unaltered and adequate for mechanical testing. Mechanical tests revealed a clear breaking point for each suture.

The PGA (polyglycolic acid) suture exhibited the lowest tensile strength of the two sutures that were used in the present study. The tensile strength of PGA sutures in salivary serum solution remained unchanged for the first three days, but by day 14 there was a noticeable drop. However, PGA demonstrated no appreciable change in tensile strength from day 0 to day 13 in another study that used lactated Ringer's solution. The C incubator, which was used in the present research but not in other studies[13] , may be the cause of this difference.Consequently, the tensile properties of sutures can be impacted by temperature and the type of solution.

When compared to other liquids like saline or milk, Vicryl soaked in saliva. In our study, saliva appears to promote suture degradation, and coating with myricetin and nicotine slightly increases tensile strength. The ideal suture should be flexible, have sufficient tensile strength, and be resorbed in 7-10 days[14]. Due to the different types of tissue involved, the presence of saliva, the advanced tissue vascularization, and the activities relating to speaking, eating, and swallowing, dental sutures are different from those used in other regions of the body[15]. To prevent harm to the oral mucosa, sutures must have particular physical features and characteristics, such as good tensile strength, dimensional stability, lack of shape memory, and appropriate flexibility[16]. Compared to other PGA monofilament and multifilament sutures, Vicryl showed the most favourable response in this study. In addition, the inflammatory response had gradually subsided over the course of three days and was almost completely gone by the seventh day. In vitro studies favour the use of synthetic absorbable sutures, and the choice of intraoral sutures should be made depending on the requirements for restoration and the surgeon's preferences[17].

In our study, myricetin has less anti-inflammatory effects than nicotine.Other studies have shown that the enhancement of inflammatory cytokines and systemic reorganisation after myricetin treatment plays an important role in promoting wound healing[18]. The results suggest that treatment with highermyricetin doses improved wound healing in rats. It might have strong anti-inflammatory effects [19].

In our study, the antioxidant effect of nicotine is low.Blood clots require time to form during the patient's healing process, and smoking should be stopped till the healing is complete to avoid its effect on sutures. Another study also quotes that the nicotine in cigarettes can interfere with the healing process and increase the risk of complications[12] like risk of tearing threads. Anything that interferes with the stitches can slow the healing process and cause healing complications. Our team has extensive knowledge and research experience that has translate into high quality publications [20–29]

5. Conclusion

According to the testing and evaluations conducted, the inclusion of myricetin,nicotine coated with polyglactin, and vicryl sutures did not change the physical handling qualities or

performance characteristics.Therefore, it is evident that eating foods that contain myricetin and the habit history of tobacco consumption that has nicotine affects absorbable sutures in oral cavity.Hence those consumption of foods and smoking should be avoided till the healing has taken place .

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Competing Interest

No potential competing interest is declared in this study.

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