



## **Comparative Evaluation of Vicryl (Polyglactin 910) and Qubix -PDX suture (Polydioxanone) for tensile strength and microbial adhesion-An invitro study.**

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### **ABSTRACT**

A surgical suture is a medical device used to hold tissues together and approximate wound edges after an injury or surgery. Appropriate sutures require specific physical properties such as tensile strength, dimensional stability, lack of memory, knot security and sufficient flexibility to avoid damage to the oral mucosa. Though sutures have a significant role in wound healing they act as a habitat for micro-organisms that can eventually lead to surgical site infection Hence the present study is conducted to assess the tensile strength and microbial adhesion of Vicryl and Qubix -PDX sutures.

**Keywords:** Knotless suture, Vicryl suture, Tensile strength

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### **I. INTRODUCTION**

A surgical suture is a medical device used to hold tissues together and approximate wound edges after an injury or surgery. Oral suturing is unlike suturing in other parts of the body due to the constant presence of saliva, high tissue vascularization, and functions related to speech, mastication, and swallowing. Suitable sutures require precise physical characteristics and properties. One of the most important mechanical properties is the tensile strength of the suture material. The tensile properties, elasticity and stiffness of the suture material are some of the factors that control the function of the suture while in clinical use<sup>1</sup>. Tensile strength is a characteristic that required to be upheld due to the fact that suture material tends to lose between 70% and 80% of its original strength. The suture threads are secured to the tissues employing various surgical knots. These knots lead to a reduction of tensile strength of the suture thread by stretching and thinning the material. The primary weakest portion in a suture line is the knot and the next weakest point is the portion adjacent to the knot<sup>2</sup>. This can lead to a breach of the thread leaving the wound exposed. These areas lead to the accumulation of food debris and become a nidus for bacterial growth and the development of infection. To overcome these surgical difficulties, the knotless barbed suture was introduced and patented in 1964, by John H Alcamo. The knotless suture is said to be self-securing without the need for any additional adhesive for the suture anchorage.

*This suture has had good clinical success in various surgical specialties such as the closure of donor leg wounds in coronary artery bypass grafting, breast surgery, laparoscopic hysterectomy, and myomectomy.*

### **OBJECTIVE**

*The main objective of the study is comparative evaluation of microbial adhesion and tensile strength of Vicryl and Qubix -PDX sutures.*

## **II. MATERIAL AND METHODS**

*The study consisted of two resorbable suture Vicryl (polyglactin 910) and Qubix -PDX knotless barbed suture (Polydioxanone) of gauze 3-0 size. A total of 20 suture samples were collected from commercially available stocks. Samples were obtained from each suture material type. All the suture samples were measured to a uniform length of 18 cm. Ten specimens from each group were tested for tensile strength before immersing into artificial saliva. Mechanical properties of the suture samples were evaluated by using universal testing machine (coupled to a computer for digital productivity). Tensile strength of the suture samples were checked at particular time period: pre-immersion (dried), 3rd, 7th and 14th days post-immersion into artificial saliva. The plaque samples were collected with 4R/4L Gracey curette and microbial adhesion was evaluated for both the groups after 7 days. (Fig 1)*

## **III. RESULTS**

*All the suture materials were intact without any visual deterioration during and at the end of soaking period in saliva. Each specimen showed an evident breaking point while testing on universal testing machine. Baseline (pre immersion) comparison of mean tensile strength is presented in Tab 1. The distribution of mean strength was significantly higher in polydioxanone group followed by polyglactin 910. The distribution and comparison of mean tensile strength among the two suture groups at 3rd, 7th and 14th day post immersion in the saliva is shown in Graph 1. Polydioxanone Group was exhibiting maximum tensile strength when compared with at all points. Both the suture materials showed significant difference in strength in mean values when baseline is compared with 14th day post immersion period. The microbial adhesion is shown in Graph 2 increased in the polydioxanone for Prevotella intermedia in comparison to the polyglactin 910 on the 7th day. The microbial colony forming units of Prevotella intermedia and Aggregatibacter Actinomycetocomitans in the suture samples are shown in Figure 2 & 3 respectively.*

## **IV. DISCUSSION**

*In the past, materials like animal hair, natural fibers, silk, nylon and gut mucosa have been used to close the surgical wounds<sup>2</sup>. A surgeon always looks for good handling characteristics and tensile strength of a suture while selecting a suture material. The tensile strength of a suture material is an indispensable property due to which suture material tolerates the tissue tension at the flap margin. Suture materials exhibiting low tensile strength are more vulnerable to breakage during the healing period because of tension created by edema and tissue tension. In the present study polyglactin 910 and polydioxanone were compared for their tensile strength and microbial adhesion. The polydioxanone showed increased microbial adhesion of anaerobic microorganisms post 7 days incubation period in comparison to polyglactin. The Prevotella intermedia colonies were more on the polydioxanone suture post immersion in artificial saliva for seven days.*

*On comparison for the tensile strength for both the sutures, the polydioxanone suture retained more than two thirds of their tensile strength for 3 days post immersion in artificial saliva. The degradation in the tensile strength of polydioxanone suture began on the 3<sup>rd</sup> day and the tensile strength was decreased in comparison to polyglactin 910. According to the findings of the other study, when PG was exposed to saliva, showed more rapid tensile strength loss, especially after 7 days<sup>3</sup>. This finding is contradictory to the finding of the current research.*

## **V. CONCLUSION**

*The present study showed that Qubix PDX sutures showed greater mechanical properties in comparison to vicryl sutures indicating its better efficiency in wound security. The microbial adhesion was found to be more in Qubix PDX that may interfere with wound healing. Further studies are needed to provide outcomes regarding safety, effectiveness of these sutures.*

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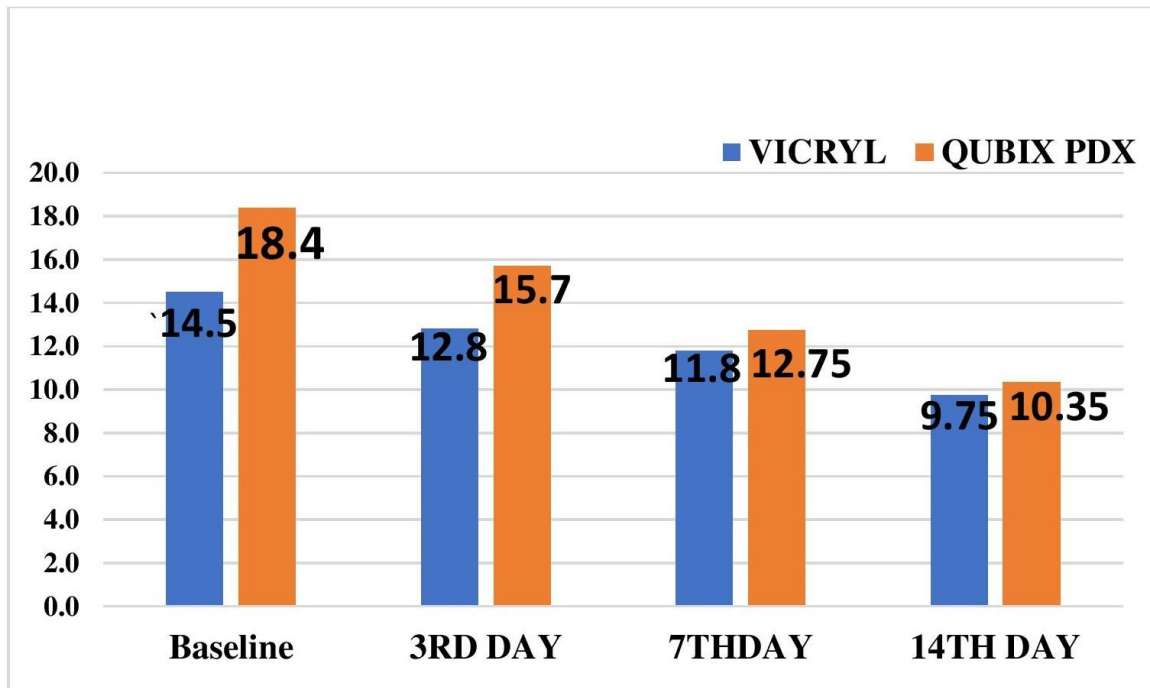
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**FIGURE 1 PLAQUE COLLECTION USING STERILE 4R/4L**

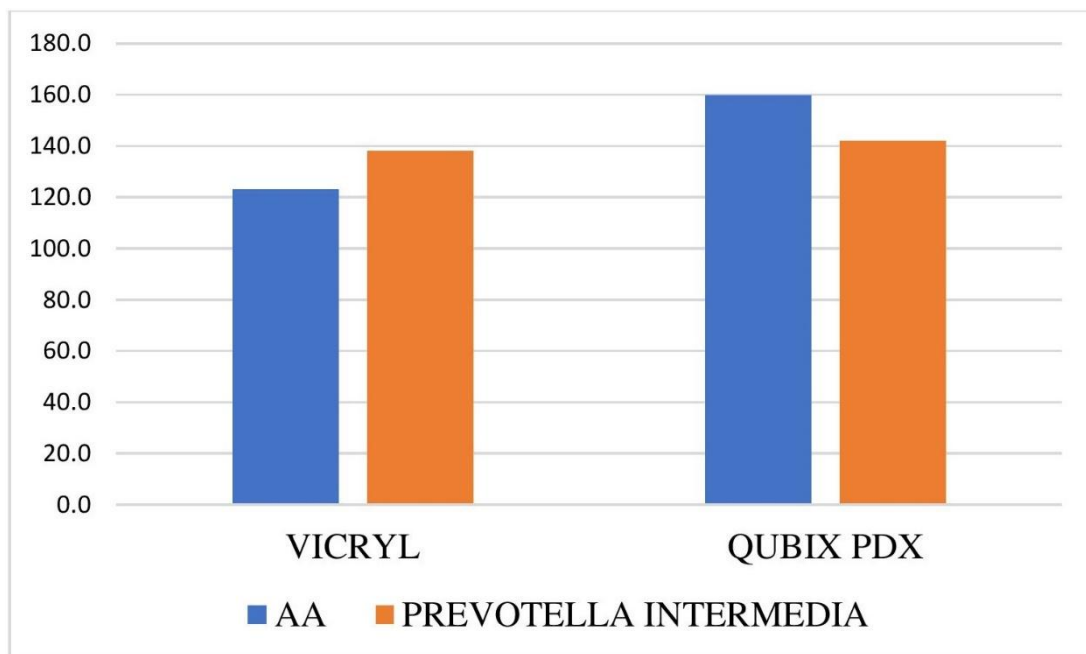


**TABLE 1-TENSILE STRENGTH OF DIFFERENT SUTURE MATERIALS AT BASELINE (PRE -IMMERSION)**

SUTURE MATERIAL	TENSILE STRENGTH
POLYGLACTIN 910	14.50±1.27
POLYDIOXANONE	18.40±1.25

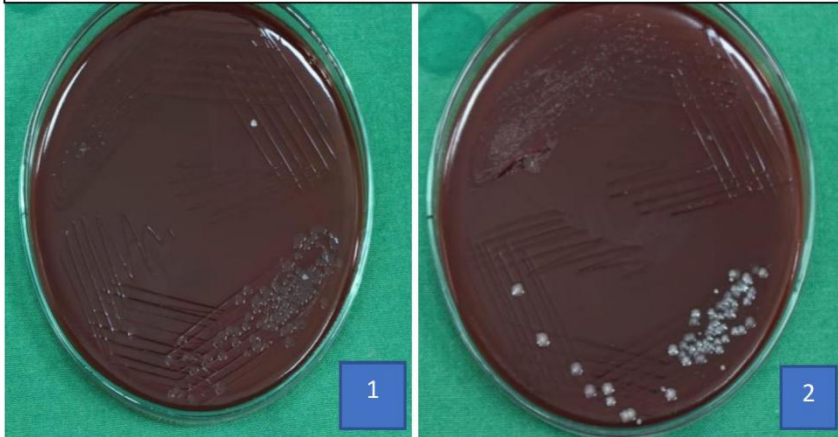


**GRAPH 1-INDICATES TENSILE STRENGTH**



**GRAPH 2- INDICATES COLONY FORMING UNITS**

**Prevotella intermedia in Group 1(polyglactin 910-Vicryl) and Group2(Polydioxanone-Qubix PDX)**



**FIGURE 3-Pinpoint colonies of AA in Group 1(Polyglactin 910-Vicryl) and Group2(Polydioxanone-Qubix PDX)**

