

Polyglactin 910 vs. Triclosan Coated Polyglactin 910 In Oral Surgery: A Comparative *In Vivo* Study

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Abstract

Purpose of the study: Suture site infection is a common complication of surgery that results in delayed healing and can even lead to systemic sepsis. It is a known fact that suture material increases the risk of wound sepsis by serving as an adherent foreign body. Wound infections often begin around the suture materials left within the wound. Hence a prospective double blinded study is undertaken to compare the efficacy of polyglactin 910 (vicryl) versus Triclosan coated polyglactin 910 (vicryl plus) in terms of reducing the bacterial adherence to suture material and promoting wound healing.

Patients and methods: The study was conducted on a sample of 40 patients reported to the department of oral & maxillofacial surgery, Mamata dental college & hospital who are planned to undergo minor oral surgical procedures. Patients are divided into 2 groups, containing 20 each. In group 1, 3-0 vicryl* and in group 2, 3-0 vicryl plus* sutures were used and the results compared. Statistical analysis was done using chi-square test, with SPSS software.

Results: Bacterial adherence to sutures was more in group 1 and is highly significant ($p < 0.001$) compared to group 2. Wound healing and the physical properties were comparable to both the materials.

Conclusion: Use of triclosan coated polyglactin 910 suture effectively reduces the bacterial load at the surgical site. As the bacteria adhering to the suture materials have potential to initiate odontogenic infections and suture removal can subsequently result in bacteremia, triclosan coated vicryl is an effective alternative in patients undergoing oral surgical procedures.

Keywords: Suture site infection; Triclosan; Polyglactin 910

Introduction

Sutures are commonly used in the oral cavity and the success of the surgical procedure depends to a great extent on proper suturing for optimal wound closure. Suture site infection is a common complication of surgery that results in delayed healing and can even lead to systemic sepsis [1]. It is a known fact that suture material increases the risk of wound sepsis by serving as an adherent foreign body. Intraoral sutures are bathed continuously in saliva and are therefore exposed to approximately 7.5×10^8 microorganisms /mL. Hence they produce a prolonged inflammatory response due to continual influx of microbial contamination along the suture channel [2]. Previous studies have shown that wound infections often begin around the suture materials left within the wound [3]. Hence the search for a more appropriate suture material has begun and resulted in various commercially available newer materials, like Triclosan, an antibacterial coated polyglactin 910 (vicryl plus*, Johnson and Johnson limited, India). Triclosan is a broad-spectrum antiseptic and has been used for over 30 years. The present prospective double blinded study is designed to compare the efficacy of polyglactin 910 (VICRYL, Johnson and Johnson limited, India.) versus Triclosan coated polyglactin 910 (VICRYL PLUS, Johnson & Johnson limited, India) in terms of reducing the bacterial adherence to suture material and promoting wound healing. Apart from assessing the suture site infection, the authors have also aimed at evaluating the intra-operative handling of both the materials.

Materials and Methods

After obtaining the ethical committee clearance from the institute and informed consent from the patients, the study was conducted on a sample of 40 patients reported to the department of oral and maxillofacial surgery, Mamata dental college & hospital, Khammam from December 2012 to December 2013. The patients were divided

into two groups, containing 20 each. In group 1, vicryl*, 3-0 absorbable, braided coated undyed polyglactin 910, 90 cm in length, manufactured by Johnson & Johnson limited, India was used and in group 2, vicryl plus*, 3-0 absorbable, braided Triclosan coated polyglactin 910, 90 cm in length, manufactured by Johnson & Johnson limited, India was used. All the patients were selected between 18-40 years of age, free of systemic conditions like diabetes mellitus, hypertension, renal dysfunction, HIV and anemia. Immunocompromised patients or patients using drugs like corticosteroids, cyclosporins etc. that cause immunosuppression were also not included in the study to eliminate bias as immunosuppression causes increased infections/ increased bacterial adherence compared to their control counterparts.

All the patients were subjected to oral prophylaxis before undertaking the procedure. All the procedures were undertaken under absolute aseptic conditions and all the patients were prescribed the same antibiotics. All the procedures were performed by a single surgeon, who along with the patients, was blind to the type of suture material being used both while suturing and at the time of removal. The various minor oral surgical procedures included were extractions of multiple teeth, alveoplasties and removal of impacted teeth. Sutures were placed in

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simple interrupted fashion in all the patients. Sutures were removed on 6th post-operative day.

After removal, sutures were placed in sterile containers inoculated into Thioglycollate medium (MV010) and transported to the laboratory without any delay. They were inoculated into Brewer's anaerobic agar (M491) (Figure 1), Kanamycin bile esculin agar (M1035) and anaerobic blood agar (M1345), supplied by Hi - Media laboratories. (Mumbai, India) The plates were incubated in anaerobic jar by using anaerobic gas pack (LE 002A). Jar was opened after 72 hours and organisms were isolated by colony morphology and biochemical reactions as described by Barton and Citron and Koneman et al. [4].

The samples were also inoculated aerobically on blood agar (M001) (Figure 2) supplied by Hi media laboratories, Mumbai. The colonies



Figure 1: Growth of bacterial colonies on Brewer's anaerobic agar.



Figure 2: Growth of bacterial colonies on blood agar.

were identified as per standard procedures. Colonies of bacteria were counted using Classical Bacterial Counting Technique and they were counted as number of Colony Forming Units (CFU).

After 24 hrs of incubation, each culture plate was placed glass side up, over the illuminated screen on a Bacterial colony counter. Colonies of bacteria were counted using a 75-mm magnifier and a handheld counter. Each colony was marked with a felt-tip pen that was used to mark over the glass above the colonies which is connected to an electronic counter that displays the numbers counted on a small screen. Colony or viable count per milliliter was calculated by multiplying the average number of colonies per countable plate by the reciprocal of the dilution and reported as 'Colony Forming Units/milliliter' (CFU/mL) or as 'viable count/milliliter' not as 'bacteria/gram' or 'bacteria/milliliter'. Clinically signs of infection and wound healing were evaluated on 1st, 6th and 15th post-operative days. Statistical analysis was done using Chi-Square Tests with SPSS software.

Results

A total of 40 patients have participated in this study of which 26 were female and 14 were male patients. However, several aerobic and anaerobic bacteria were found adherent to the suture materials, which included β -hemolytic streptococci, staphylococci, peptostreptococci, propionibacterium, prevotella and tannerella. Among aerobes β -hemolytic streptococci were found in highest numbers (in group 1, n=6, 85.7% and in group 2, n=2, 100%) while it was peptostreptococci in anaerobes (in group 1 n=6, 60% and in group 2, n=1, 100%).

Bacterial adherence to sutures was more in group 1 and is highly significant ($p < 0.001$) compared to group 2. In group 1, aerobic bacteria were seen in 7 out of 20 samples (35%) while in group 2, aerobes were seen adherent in only 2 out of 20 samples (10%). Though, there is difference in adherence of aerobic bacteria between both the groups, it is not statistically significant ($p = 0.058$) while the difference in adherence of anaerobic bacteria is statistically significant between both the groups, 50% in group 1 and 5% in group 2 ($p = 0.001$).

Though statistically not significant ($p = 0.204$), healing at the surgical site was slightly better in group 2 than in group 1 as on 6th post-operative day, mild wound dehiscence was present in 65% of population in group 1 while in group 2 only 45% showed gaping at the incision site. Examination on 15th post-operative day showed wound healing was complete and satisfactory in both the groups. None of the patients developed suture site infection (Table 1).

No significant difference was found between vicryl* and vicryl plus* in mechanical properties like physical strength, knot holding capacity and ease of handling the material. All the surgeries were performed by the first author who could not differentiate between both the suture materials while operating. No allergies were reported to triclosan in our sample population.

Discussion

Physical properties and configuration of suture materials influence the degree of surgical site infection [5]. Elek and Conan in 1957 have

Criteria	Group 1	Group 2	P value
Aerobic Bacteria Present	7 (35%)	2 (10%)	$\chi^2 = 3.584$; df = 1; $p = 0.058$; Not Significant
Anaerobic Bacteria Present	10 (50%)	1 (5%)	$\chi^2 = 10.157$; df = 1; $p = 0.001$; Significant
Any Bacteria Present	13 (65%)	2 (10%)	$\chi^2 = 12.907$; df = 1; $p < 0.001$; Highly Significant
Gaping Present At Surgical Site / Wound Dehiscence	7 (35%)	11 (55%)	$\chi^2 = 1.616$; df = 1; $p = 0.204$; Not significant

Table 1: Comparison of results obtained from group 1 and group 2.

proved after their experiment that, introducing staphylococci on a silk suture placed in the subcutaneous tissue enhances the development of infection to as high as 10,000 fold [6]. Shmuel Katz et al. [7] after their study using radiolabelled bacteria have stated that bacterial adherence to suture materials plays a significant role in the induction of surgical infection. In the present study, authors observed a significant difference in bacterial adherence between vicryl and triclosan coated vicryl, the latter being effective in reducing the bacterial count at the surgical site. These results are in accordance with those of Charles E. Edmiston et al. and Gomez Alonso et al. [8,9]. Wound healing at the surgical site appeared slightly better in group 1 patients than group in 2 patients on 6th post-operative day. Though triclosan coated vicryl appeared to result in better wound healing compared to vicryl, the difference was not significant. These results are comparable to those obtained by Storch et al. [10], who have concluded that triclosan didn't affect the wound healing. The authors didn't find any significant difference between vicryl and vicryl plus in mechanical properties like physical strength, knot holding capacity and ease of handling the material. These results are similar to those obtained by Ford [11] and his associates who have compared the physical properties of triclosan coated polyglactin 910 with polyglactin 910 sutures in pediatric patients undergoing general surgical procedures. None of our patients developed allergy or tissue reaction to triclosan. Tissue reactions caused by both vicryl and vicryl plus were reported in the literature, but these reactions happened rarely and the incidence was same for both vicryl and vicryl plus, so they can't be attributed to triclosan [12]. Furthermore, the safety of triclosan is well established, stating that it doesn't possess carcinogenic or sensitization potential [13]. From the present study it is evident that bacteria found adherent to sutures are the similar bacteria seen in case of odontogenic infections of head and neck, which was also an incidental finding in the *in vivo* study conducted by Giuliana Banche et al. [14] in 2007. Introral suture removal is known to cause bacteremia which could be a potential risk factor for developing bacterial endocarditis in high risk patients [15].

Conclusion

Triclosan is effective in significantly reducing the bacterial adherence to suture material which would decrease the surgical site infection and morbidity. The physical properties of both vicryl and vicryl plus are comparable. As the bacteria adhering to the suture materials have potential to initiate odontogenic infections and as the literature is replete with articles stating that suture removal can subsequently result in bacteremia, triclosan coated vicryl is an effective alternative in high risk patients undergoing oral surgical procedures.

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