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## **Comparison of chlorhexidine coated polyglycolic acid sutures with silk sutures during third molar surgery: A prospective, randomized, double-blind clinical study**

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**Abstract**---Aim: The purpose of this study was to compare chlorhexidine coated polyglycolic acid sutures with silk sutures during third molar surgery. Materials And Methods: The study design was a double-blinded randomized control trial. Patients who visited the department of oral and maxillofacial surgery for the surgical removal of mesioangular impacted third molar were assessed for enrolment. A total of 20 patients participated in this study. Patients were divided into two groups. Group A consisted of patients who received chlorhexidine coated polyglycolic acid sutures. Group B consisted of patients who received silk sutures. Surgical removal of the impacted mandibular third molar was done. Post operatively all Patients in both groups were prescribed with Amoxicillin 500mg for 5 days three times a day and Diclofenac 50 mg thrice daily for 3 days. Patients were asked to report back after a week for review. They were contacted over the telephone to score postoperative pain. If the pain score was greater than 5 they were asked to report to the hospital. Results: In group A a mean postoperative pain score of 4 was observed. In Group B a mean postoperative pain score of 3 was observed. The pain was rated using the numerical pain rating scale (1-6). In group A there were no signs of inflammation present postoperatively. In group B, two patients reported back with surgical site inflammation and three cases reported back with dry sockets. Conclusion: In this study, we conclude that there were only marginal

differences in the postoperative pain when both the suture materials were used. However, no signs of inflammations were observed when chlorhexidine coated polyglycolic acid sutures were used.

**Keywords**---chlorhexidine suture, silk suture, polyglycolic suture, third molar surgery, inflammation.

## **Introduction**

Surgical removal of the third molars is the most frequent intervention performed in oral surgery. It is associated with several postoperative complications (Barone et al. 2019). The spectrum of postoperative complications can be postoperative pain and swelling. In certain cases, it can lead to permanent nerve damage, mandibular fractures, and life threatening infections (Krekmanov and Nordenram 1986). Surgical site infection is also one of the postoperative local complications that may arise during the surgical procedure (Sala-Pérez et al. 2016). When an infection is present at or near the surgical incision within 30 days of an operative procedure it contributes to significant surgical morbidity and mortality (Reichman and Greenberg 2009).

Sutures have a non shedding surface to which bacterias can adhere and form biofilms which in turn can result in a surgical site infection. The coating of sutures with the antibacterial agents has the potential to reduce surgical site infections and can also reduce antibiotic overuse (Leaper et al. 2010). Various antibacterial sutures available in the market are Vicryl Plus, Monocryl Plus. In 2002, the US Food and Drug association gave approval for braided polyglactin 910, Vicryl Plus which is the first antimicrobial surgical suture coated with triclosan (Ming, Rothenburger, and Yang 2007).

Chlorhexidine is a synthetic antimicrobial drug that is bacteriostatic at a low concentration and bactericidal at a higher concentration (P. A. Karde et al. 2019). Chlorhexidine coated sutures such as PECTRYL CS and Dolphin sutures are available in the market. These are absorbable braided dyed polyglactin 910 (3-0) coated with chlorhexidine (P. Karde, Sethi, and Joshi 2016). Chlorhexidine has already been established for a variety of medical applications such as coating of medical devices, skin antiseptics, and oral antiseptics. These sutures demonstrate high efficacy against *Staphylococcus aureus* (Obermeier et al. 2014).

A large diversity of experimental studies have been conducted which showed a reduction in surgical site infections when these sutures were used (P. A. Karde et al. 2019). The oral cavity is a highly contaminated area. Though the incidence of a surgical site infection after the surgical removal of the third molar is minimal its occurrence cannot be completely neglected. With a rich case bank established over 3 decades we have been able to publish extensively in our domain (Senthil Kumar et al. 2019; Wahab et al. 2018; J et al. 2018; Eapen, Baig, and Avinash 2017; Marimuthu et al. 2018; Jain and Nazar 2018; Abhinav et al. 2019; Sweta, Abhinav, and Ramesh 2019; Abdul Wahab et al. 2017; Ramadorai, Ravi, and Narayanan 2019; Patil et al. 2017). Based on this inspiration we aim to compare the efficacy of chlorhexidine coated polyglycolic acid sutures with silk sutures.

## **Materials and Methods**

This is a double blinded, prospective, randomized clinical controlled study that was conducted in the department of oral and maxillofacial Surgery, Saveetha Dental College, Chennai, India between July 2019 and February 2020. A total of 20 patients participated in the study out of which 10 were males and 10 were females. A written informed consent was obtained from all the participants. Ethical approval was obtained from an Institutional Ethical Committee. The participants included in this study were between the age group of 20 - 30 years. All the participants with mesioangular impacted third molar were enrolled in the study. Patients with systemic diseases, active infection, pregnant women, drug abusers, alcohol users were excluded from the study. These patients were also excluded if they declined to participate. A single operator performed the surgery on all the patients. Postoperative follow up was done on the 7 th day. Patients were contacted over the telephone to score the pain. If the score was greater than 5 they were asked to report back.

Based on a computer assisted random sampling, participants were divided into two groups. In the group A, patients received chlorhexidine coated polyglycolic acid sutures. In Group B patients received silk sutures. A single operator performed the surgery on all patients. All the patients underwent the surgical removal of mandibular third molar under local anesthesia which consisted of 1: 200000 adrenaline. At Least 3 surgical knots of chlorhexidine coated polyglycolic acid sutures and silk sutures were used to close the flap at the surgical site. Postoperative medication consisted of Amoxicillin 500mg for 5 days and Diclofenac 50 mg thrice daily for 3 days given to all the patients in the study. Postoperative instructions were given to the patient. Postoperative follow up was done on the 7 th day. Patients were contacted over the telephone to score the pain. If the score was greater than 5 they were asked to report back. The primary outcome measured was the post operative pain. The secondary outcome measured was the post operative inflammation. Pain with respect to the extraction site was analyzed using the numerical rating scale. Postoperative inflammation was analyzed by the presence or absence of inflammation.

## **Statistical Analysis**

The numerical pain rating scale was analyzed with chi square test. SPSS statistical software was used for analysis

## **Results**

In group A a mean postoperative pain score of 4 was observed. In Group B a mean postoperative pain score of 3 was observed. The pain was rated using the numerical pain rating scale (1-6). In group A there were no signs of inflammation present postoperatively. In group B, two patients reported back with postoperative surgical site inflammation and three cases reported back with dry sockets.

## **Discussion**

Since the 1960s the role of suture materials in the development of infection has

been a topic of discussion (Alexander, Kaplan, and Altmeier 1967). Surgical sutures are known for their potential to lead to a wound infection. It can potentiate infection when necrotic or devascularized or dead space caused by tissue damage or poor surgical technique is present. Depending on the type of the suture materials degree of infection elicited can be varied. It has been observed that the physical and chemical composition of the suture material plays a very important role in the interaction between the bacteria and the suture. This can lead to the severity and persistence of wound infection. Studies have indicated that nylon monofilament is the suture in which a minimal amount of bacteria remains adhered (Katz, Izhar, and Mirelman 1981). Triclosan is effective in significantly reducing the bacterial adherence on the sutures. Christopher Justinger et al stated in his study that Vicryl plus, triclosan coated polyglactin 910 sutures can be used to prevent the contamination of suture materials (Justinger et al. 2009). In certain in vitro studies, vicryl plus sutures recorded no bacterial inhibition zone around the suture with microorganism from a human saliva sample (Venema et al. 2011)

In this study, we observed that there were no signs of infection on the surgical site in patients who belonged to Group A. However there were 3 cases of dry sockets were observed in Group B. Kunal Sunder et al quoted that maximum biofilm inhibition was noted in with chlorhexidine sutures followed by triclosan sutures. This fact was proved and stated by a confocal laser scan and scanning laser microscopy. The same study indicated that colony-forming units obtained using plain coated sutures were highest when compared with chlorhexidine coated sutures. The mean CFUs/ml is 82 and 127 respectively for chlorhexidine and plain uncoated suture (P. Karde, Sethi, and Joshi 2016).

In this study patients in group A had no sign of inflammation. Certain studies suggest that the usage of 40%v/v chlorhexidine as a coating on the suture can act against staphylococcus aureus, Staphylococcus epidermidis and Escherichia coli (Walker et al. 2009). Andreas et al stated that coating of sutures with chlorhexidine laurate proved acceptable cytotoxicity and high antimicrobial protection for several days (Obermeier et al. 2014). In the present study two patients belonging to group B, reported back postoperatively with swelling. Studies have recorded that on silk sutures a bacterial colony of about 778 cfu/cm/ml is observed after 3 days while 468cfu/cm/ml is observed after 7 days. This phenomenon is justified by the fact that the inability to maintain adequate oral hygiene as a result of limited mouth opening pain and swelling is present until the third postoperative day. Coagulase-negative staphylococcus was observed in 8.3 % of the silk sutures (Sala-Pérez et al. 2016).

In group B participants incidence of dry sockets was observed in three patients. Fransesco et al stated that after a surgical intervention in the oral cavity when the microscopic analysis of silk suture was done, a high degree of aerobic bacteria was present. This included Streptococcus viridans, staphylococci and corynebacterium were detected. Streptococcus pyogenes and Enterobacterium was also present (Sortino, Lombardo, and Sciacca 2008). This may be the reason why dry socket and signs of inflammation were evident in the patient using silk sutures (group B). Silk sutures are still preferred by the surgeons because of its easy handling properties. However, these silk sutures are known to cause a

strong inflammatory response because of the molecular composition present in them (Sortino, Lombardo, and Sciacca 2008).

A study that evaluated chlorhexidine sutures and triclosan suture concluded that the former has antibacterial properties against many periodontal pathogens. Results from the study reveal that chlorhexidine sutures have a potential role against periodontal pathogens and can play a major role in the prevention of surgical site infection. However, further *in vivo* studies need to be conducted to establish this fact (Sortino, Lombardo, and Sciacca 2008; P. Karde, Sethi, and Joshi 2016).

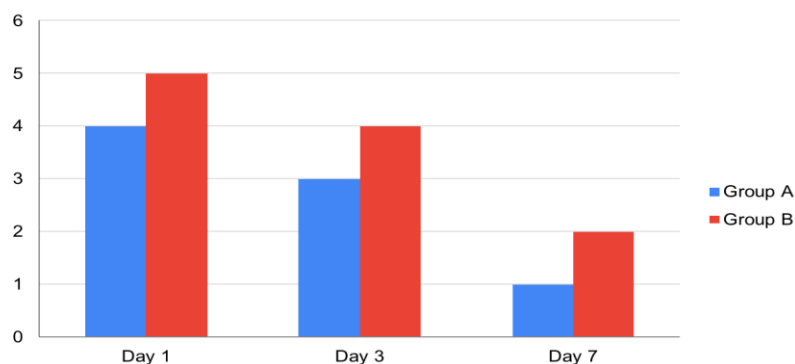


Figure 1: This figure indicates the post operative pain present between both the groups. Xaxis denotes the days in which the pain was observed . The y axis denotes the numerical pain rating scale. The blue colour signifies participants using chlorhexidine coated polyglycolic acid sutures. The red colour indicates the participants with silk sutures.

## Conclusion

In this study, we conclude that there were only marginal differences in the postoperative pain when both the suture materials were used. However, no signs of inflammation were observed when polyglycolic acid sutures were used.

## Contribution of Author

The corresponding author has conducted the study and has written the manuscript. The co author has corrected the manuscript.

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