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Comparison and Evaluation of Different Suture Materials used for the Post-Operative Closure Following Extraction of Third molars.

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Abstract: Suture materials play a very important role in healing and enabling reconstruction and reassembly of tissue separated by the surgical procedure or trauma. Suture materials are used daily in oral surgery, and are considered to be substances most commonly implanted in the human body. Silk has been used as biomedical suture material for centuries and it provides important clinical repair options for many applications but the disadvantage is the biocompatibility problems .In the present day, Vicryl suture material is the most commonly used material in oral surgery, as it proves to be more biocompatible and plaque accumulation is reduced . Evaluation of 685 patients undergoing third molar extractions and evaluate the type of suture material given and compare between the different suture materials and their efficacy . Excel tabulation was done and SPSS results were derived .The study was able to evaluate and notice that Silk suture material was the most commonly given suture material and based it was also seen that the plaque accumulation was more in patients given silk sutures while Vicryl sutures was used the most post extraction of 18,28.From the present study we were able to conclude that Silk was the commonly used suture Material and the incidence of surgical site infection were greater in these patients . Of the 63 patients that were given Vicryl Sutures , there was no Surgical Site Infection (SSI) observed in any of the patients , this is attributed to the Antibacterial properties of Vicryl sutures that helps in avoiding surgical site infections ,

Keywords: Extractions ; Silk ; Surgical Site Infections(SSI) ; Suture ; Third molar ; Vicryl ; Innovative

INTRODUCTION

The oral surgical extraction of impacted third molars till date remains as one of the most commonly performed surgical procedures in Oral Surgery (Patturaja and Pradeep, 2016; Kumar, 2017b) . The most common complaints being pain and trismus (Rao and Santhosh Kumar, 2018) (Kumar, 2017c). Surgical site infection (SSI) is among the postoperative local complications that may arise in this surgical procedure. The Post operative infection rate after extraction is around 5% (Osborn *et al.*, 1985). Surgical site infections are. One of the most important post operative complications . Many factors lead to the postoperative complications following a third molar extraction . This may involve many factors which can be mainly grouped as intrinsic factors and extrinsic factors. Intrinsic factors are those which may involve diabetes mellitus, local or systemic infections, salivary gland disorders (Packiri, 2017; Patil *et al.*, 2017a),malignant oral conditions (Patil *et al.*, 2017a),the human pathogens have been isolated from oral secretions (Kumar and Rahman, 2017), infective endocarditis (Kumar and Sneha, 2016), HIV (Kumar, 2017a) and Extrinsic factors may include contaminated surgery, smoking , wound contamination . 2 Implantations for further suture materials only increases the chance of surgical site infections (Forbes *et al.*, 2008),(Leaper *et al.*, 2010) alveolar osteitis (Jesudasan, Abdul Wahab and Muthu Sekhar, 2015) .

In previous studies conducted on the same it was seen that the number of bacteria required for the development of a SSI is about 100,000 times lower in the presence of suture material (Stern and Elek, 1957) , (Abhinav *et al.*, 2019)

Over the years various methods have been developed to reduce SSI . Suture materials play a very important role in healing wounds and in reconstruction and reassembly of tissue separated by a surgical procedure and help in facilitating and promoting healing and haemostasis (Banche *et al.*, 2007). The most important Characteristics that must be present in any suture material are mainly - the ease of handling, good sterility, excellent uniform tensile strength and its ability to prevent plaque accumulation . Off these qualities, the most

Important qualities of a suture Material must be it's biocompatibility and minimal knot slippage. The clinician must select the suture material and diameter based on the thickness of the tissue to be sutured and whether there is a need for flap tension (Gusman, 2012)

Suture materials have been developed with antibacterial prosperities to lower the incidence of SSI. Some of the most commonly used antibacterial sutures materials are :

- Polyglactin 910 (Vicryl® Plus Antibacte- rial suture)
- Poliglecaprone 25 (Monocryl® Plus Anti- bacterial suture) (Ming, Nichols and Rothenburger, 2007) ,
- Polydioxanone (PDS® Plus Anti- bacterial suture) with coated triclosan and chlorhexidine for improved antibacterial properties have also been developed .(Ming, Rothenburger and Nichols, 2008) , (Storch *et al.*, 2002)

VICRYL (polyglactin 910) is a synthetic, multifilament and absorbable suturing material. Vicryl is a polyester used for absorbable sutures and surgical mesh, especially in ophthalmic surgery. 2-Hydroxy-propanoic acid polymer with polymerized hydroxyacetic acid. This material is the one that is preferred in dentistry. It has been proven clinically excellent because it does not allow adherence of plaque and is well suited for handling. In addition, it shows no intensive local reaction. Vicryl rapide contributes to faster healing of wounds in humans, with the lower incidence of dehiscence and milder local reactions (Gómez-Alonso *et al.*, 2007) . Vicryl sutures are mostly used in Orthognathic surgery and Cancer surgeries to prevent and minimise the risk of postoperative infection and risk for Surgical Site infections (Christabel *et al.*, 2016; Marimuthu *et al.*, 2018) .

Various studies have been conducted to evaluate the properties of antibacterial suture materials and they have shown an important reduction in the number of microorganisms including gram positive and gram negative bacteria from the surface of these sutures and a relative decrease in SSI (Rozzelle, Leonardo and Li, 2008)

Despite the low incidence of SSI after surgical extraction of third molars in causes where sutures were given . Our department is passionate about research we have published numerous high quality articles in this domain over the past years ((Kavitha *et al.*, 2014) , (Praveen *et al.*, 2001),(Devi and Gnanavel, 2014), (Putchala *et al.*, 2013), (Vijayakumar *et al.*, 2010), (Lekha *et al.*, 2014a, 2014b) (Danda, 2010) (Danda, 2010) (Parthasarathy *et al.*, 2016) (Gopalakannan, Senthilvelan and Ranganathan, 2012), (Rajendran *et al.*, 2019), (Govindaraju, Neelakantan and Gutmann, 2017), (P. Neelakantan *et al.*, 2015), (PradeepKumar *et al.*, 2016), (Sajan *et al.*, 2011), (Lekha *et al.*, 2014a), (Neelakantan, Grotra and Sharma, 2013), (Patil *et al.*, 2017b), (Jeevanandan and Govindaraju, 2018), (Abdul Wahab *et al.*, 2017), (Eapen, Baig and Avinash, 2017), (Menon *et al.*, 2018), (Wahab *et al.*, 2018), (Vishnu Prasad *et al.*, 2018), (Uthrakumar *et al.*, 2010), (Ashok, Ajith and Sivanesan, 2017), (Prasanna Neelakantan *et al.*, 2015). The aim of the study was to compare the efficacy , efficiency of both the sutures – Silk and Vicryl , in the post operative closure of third molars .

MATERIALS AND METHODS

Study Setting

The study was conducted with the approval of the Institutional Ethics Committee [SDC/SIHEC/2020/DIASDATA/0619-0320]. The study consisted of one reviewer, one assessor and one guide .

Study Design

The study was designed to include all dental patients of 18 years and above undergoing extraction of third molars. The patients who did not fall into this inclusion criteria were excluded.

Sampling Technique

The study was based on a non probability consecutive sampling method. To minimise sampling bias, all case sheets of patients who underwent Orthodontic treatment were reviewed and included.

Data Collection and Tabulation

Data Collection was done using the patient database with the timeframe work 01 June 2019 and 31 march 2020. About 685 case sheets were reviewed and those fitting under the inclusion criteria were included. Cross verification was done with the help of Photographs and radiographic evidence. To minimise sampling bias all data were included. The exclusion criteria was patients with systemic illness. Data was downloaded from DIAS and imported to Excel, Tabulation was done. The values were tabulated and analysed.

Statistical Analysis

Descriptive statistics were performed using SPSS by IBM on the tabulated values. Chi-Square test was performed and the p value was determined to evaluate the significance of the variables it was used to evaluate the association between the age and gender with the suture material used post extraction of third molars. The results were obtained in the form of graphs and tables.

RESULTS AND DISCUSSION

From the present study we were able to see that Silk sutures were used the most in the post operative closure following extraction of Third molars . Silk suture material is multifilament and non absorbable suture material – composed of fibroin , Sericin (Kaplan *et al.*, 1997). It has excellent strength and handling properties and is flexible – this was seen and compared to a few studies it showed that in silk sutures there was an increased presence of bacterial growth when compared to Vicryl Suture (Sala-Perez *et al.*, 2016). The results depict that there were more usage of silk suture material post operatively to third molars extraction .

According to Figure 2 we were able to see that based on age wise evaluation of the study group we were able to see that silk sutures were the most used in all age groups but Vicryl sutures were used the highest in the age group 18-32 years and the least in the age group 53-72 years .

According to Figure 4 we were able to see that based on gender wise evaluation of the study group of 685 patients , 291 patients were female and 394 patients were Male . The preference of Vicryl sutures were found to be more in Females .

According to Figure 3 based on the evaluation of which third molars the sutures were given on , Vicryl sutures were used the most in the post operative closure of 18,28 when compared to 38,48. While silk was the most preferred material used in the post operative closure of 38,48.

Surgical site infection is the third most common cause of nosocomial infections, and the most among surgical patients (Emori and Gaynes, 1993). About Two-thirds of all cases of SSI appear in the zone of the incision. This likelihood is even greater in the presence of suture material ('National Nosocomial Infections Surveillance (NNIS) Report, data summary from October 1986–April 1996, issued May 1996', 1996) . Many methods have been developed and have been studied upon to decrease the development of a surgical site infection following third molars extractions the most common and effective one being the usage of Antibacterial suture material for the post operative closure following extraction of third molars .

In our study 622 patients were given Silk suture material following extraction and 63 patients were given Vicryl sutures following extraction . On evaluating the sutures and postoperative complications of all the 622 patients that were given Silk suture 37 patients had developed complications and reported back with pain . While no patients had reported back with any complications following given Vicryl sutures after extractions . From this we were able to see that the incidences of postoperative complications are higher in the case of Silk suture material and Vicryl being a Antibacterial suture material has effectively showed no postoperative complications hence proving it to be more efficient in the post operative closure following Third molar extractions . In a study conducted by Sergi-Sala-Perez et.al on the effects of suturing materials on third molar surgery it was shown that when the silk material is used as a suture material, there was presence of bacterial growth when compared to vicryl in which bacterial growth was absent (Yilmaz *et al.*, 2010) .

In previous studies conducted to evaluate the presence of microbes on Silk sutures it was seen that Streptococci belonging to the viridans group were the most prevalent species with both sutures, followed by Neisseria spp. and coagulase negative Staphylococcus (Sala-Perez *et al.*, 2016; Abhinav, Sweta and Ramesh, 2019; Jain *et al.*, 2019). Based on studies conducted on evaluating various other antibacterial sutures used such as triclosan and chlorhexidine coated suture it was seen that Triclosan is an antiseptic component with bacteriostatic action. At low concentrations, inhibits the growth of many non sporulating gram positive and gram-negative bacterial species. The main objective of antibacterial sutures has been to reduce the SSI rate by inhibiting bacterial growth onto the surface of the suture material. Future scope of the study aims at reducing and eliminating Surgical site infections in silk sutures and to prevent any postoperative complications due to the suture material used following third molar extractions .

CONCLUSION

Within the limits of the study it can be concluded that Silk sutures had higher incidence of Surgical site infections when compared to Vicryl (Polyglactin) sutures, where no surgical site infection was noticed in the cases observed. Thus Vicryl sutures have good antibacterial property which helps in avoiding SSI in patients. Overall consensus matches with the data and other previously conducted studies on the same . This should be Implemented in clinical practice more often.

Author Contribution

All authors contributed equally to the work.

Conflict of Interest

The authors would like to declare that there is no conflict of interests.

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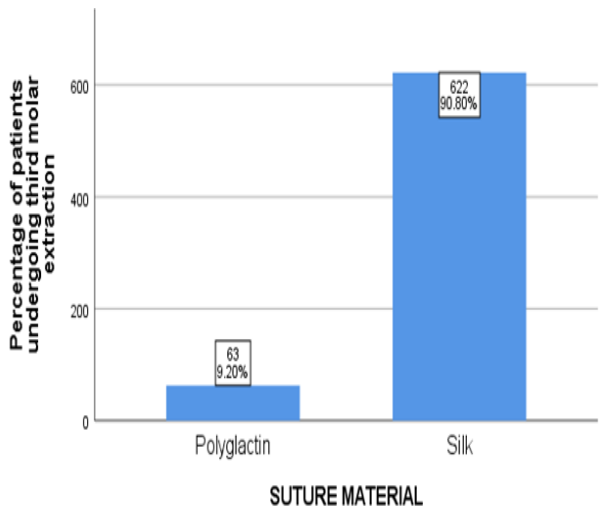

Fig.1: The graph represents the frequency of distribution of suture materials given post extraction of third molars . X axis represents the different suture materials and Y axis represents the percentage of patients undergoing third molar extractions. It was observed that 9.20% of the patients undergoing third molar extraction were given Polyglactin sutures postoperatively,

90.80% were given silk sutures. Thus, Silk suture material was the most widely used for post extraction of third molars .

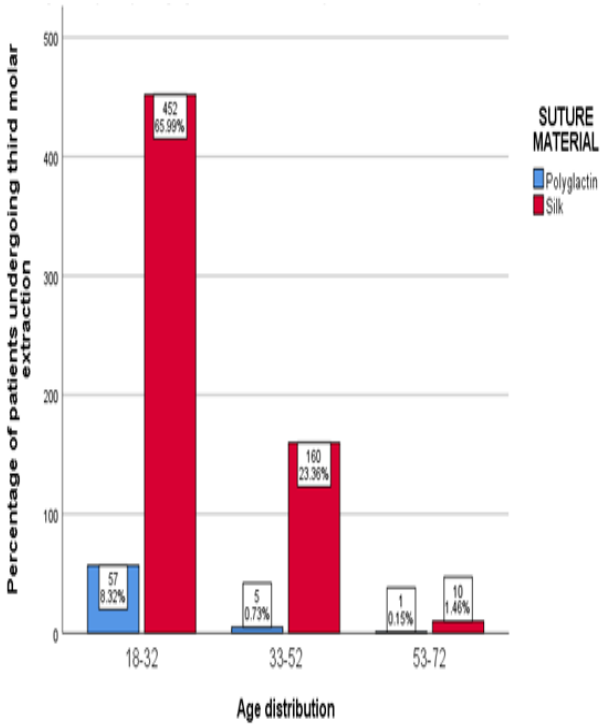

Fig.2: The graph represents the association between age groups and the suture material used post extraction of the third molar . X axis represents the age groups and Y axis the percentage of patients. Silk was the most preferred suture material in all the age groups. While polyglactin sutures were seen to be more preferred among 18-32 years of age. However, Chi square test did not show any statistical significance with Pearson Chi Square value- 9.955[a], p = 0.07(p >0.05).

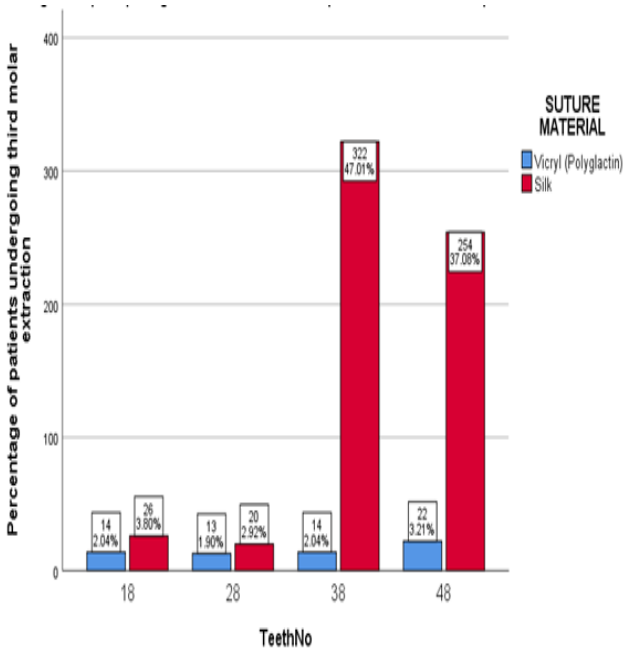

Fig.3: The graph represents the association between the tooth number and the suture material used post extraction of the third molar. X axis - represents the tooth number ; Y axis Number of

patients. It can be inferred from this graph that Silk (red) was the most preferred suture material given post extraction of 38,48, which was also confirmed by Chi square test which showed statistical significance with (Pearson Chi Square value- 78.599[a)] ,p =0.00, (p <0.05).

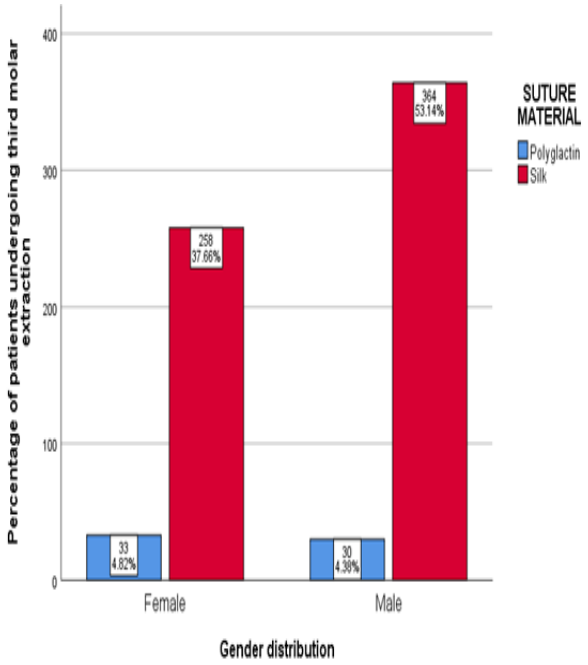

Fig.4: The graph represents the association between the gender and the suture material used post extraction of the third molar. X axis represents Gender distribution;Y axis the Number of patients. It can be inferred from this graph that Silk was the most preferred suture material in both the genders while polyglactin sutures was more preferred among females than males. However, Chi square test did not show any statistical significance with Pearson Chi Square value- 2.782[a] ,p value- 0.095, p value >0.05

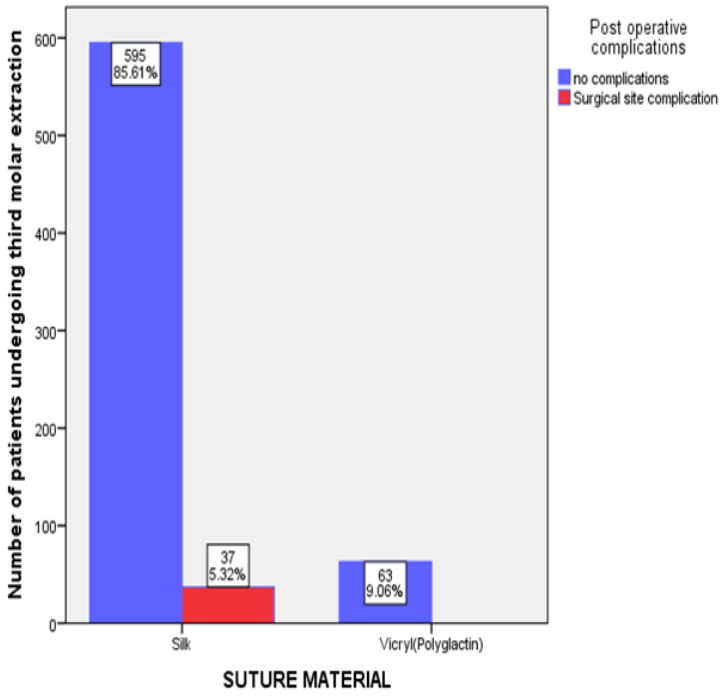

Fig.5 : Bar graph represents the association between suture material and postoperative complications following extraction of the third molar . X axis represents the suture material ; Y axis the number of patients. It can be inferred from this graph that silk suture material had 5.32% of Surgical site infection and Vicryl suture had no postoperative complications. Which was also

confirmed by chi square analysis which showed statistical significance with (Pearson Chi Square value- 699.901[a)] ,p=0.00, (p<0.05).