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Oral post-surgical healing with polyglycolic acid suture

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Abstract

Objective: To improve oral post-surgical cicatrization with the use of resorbable polyglycolic acid (PGA) suture in patients undergoing dental implant surgery, by clinical assessment of signs of infection at 8, 15 and 30 days post-surgery.

Method: Prospective analytical clinical research in patients of the Dental Implantology Clinic of the UniCIEO University Foundation, who underwent dental implant surgery and/or site adaptation for the placement of future implants (alveoli preservation, maxillary sinus graft and exodontics) and with the use of PGA 3.0s and 4.0s suture. They were carried out clinical controls at 8, 15 and 30 days post-surgery to evaluate the presence of pain, edema, flushing, tissue confrontation and loss of stitches.

Results: Total of the sample 19 patients (26 procedures), 13 women and 6 men with average age of 60.05 years, total of implants placed 57, with guided bone regeneration 8 patients, graft in maxillary sinus 6 patients and exodontics 3 patients. The symptoms of pain, edema and flushing were decreasing from 8 days after surgery to disappear at 30 days, with a significant difference (Chi square $p = 0.012$).

Conclusion: The use of resorbable polyglycolic acid (PGA) suture in oral implantology procedures presents a good healing process and the minimum biological complications disappeared after 30 days post-surgery.

Keywords: Polyglycolic acid; Oral Healing; Resorbable suture Biological Complications. Polyglycolic Suture

1. Introduction

In dental practice there are different causes responsible for short-term post-surgical complications. One of them can be the type of suture used in the closure of wounds, facilitating the accumulation of bacteria and preventing the healing process with exposure of the materials used and bone tissues (1) (2) (3) (4).

The sutures must be able to provide adequate tension to stabilize the flaps and promote healing by first intention; do not leave dead spaces, do not produce ischemia, completely cover the bone tissue to avoid resorptions and maintain hemostasis.

Sutures are classified into *non-resorbable and resorbable*. *Polyglycolic acid* (PGA) is a resorbable suture due to its physicochemical properties because it is a biodegradable thermoplastic polymer, which is synthesized by condensation or polymerization with the opening of the glycolic acid ring. The PGA is formed by interlocking threads of multifilament

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suture and its presentation can be direct or coated. The coating helps to obtain a pseudomonofilament structure that reduces capillarity, increases sliding, but facilitates the dissolution of the knot (5). It presents a slow reabsorption that begins after 10 to 15 days of its placement in tissues and ends after 90 to 180 days. The degradation process is erosive in two phases, during which the polymer is converted to glycolic acid. When exposed to physiological conditions, PGA is degraded by hydrolysis processes, but also by some classes of enzymes (particularly from the esterase family). The degradation of glycolic acid is non-toxic and can enter the Krebs cycle, at the end of which it degrades into water and carbon dioxide. A part of the glycolic acid is eliminated by the kidneys (6).

Several studies conducted on polyglycolic acid sutures showed, how the material loses half of its strength in about two weeks and 100% a month. The polymer is then completely absorbed by the body in a time of 4-6 months (7).

PGA fibers are characterized by having a high tensile strength, approximately 7GPa. Among the multiple types of sutures, PGA and SSA 90 are characterized by having polycaprolactone and calcium stearate coating that confers optimal maneuverability and good fluidity, after several entries into the tissue; high initial resistance, which occurs after about 50-80 days of laying (6). The authors suggest removing sutures as soon as possible (between 6 to 10 days) after oral surgeries.

Balamurugan (8), investigated the clinical and histological response between the absorbable suture of PGA and silk, finding a greater edema response in silk sutures with respect to PGA.

Gazivoda on 2015 (9), examined the speed of wound healing and incidence of complications, after the use of three different absorbable synthetic suture materials in oral surgery (catgut, PGA (Dexon®) and Poliglactin 910 (Vicryl Rapide®)). As a result it was observed that the fastest healing was with Vicryl Rapide® compared to the other two suture materials and there were no significant differences regarding the presence of local reaction in the three types of sutures at 21 days.

It has been shown that the suture used in oral and maxillofacial surgery should be different from that of other branches of medicine, due to the characteristics of the tissues involved, constant presence of saliva, bacteria, temperature variations, high level of vascularization and variety of functions that are performed chewing, swallowing, phonation and breathing (9)(6). Consequently, the use of sutures with an optimal lifespan in the mouth, (Assucryl®) can contribute significantly to good results in surgical procedures and in the quality of life of patients (10).

Based on the above information, the *objective* of this research was: To assess oral post-surgical healing with resorbable suture of polyglycolic acid (Assucryl®) in patients undergoing oral implant surgery by clinical assessment of signs of infection at 8, 15 and 30 days post-surgery.

2. Methods

Longitudinal analytical observational clinical prospective research for 3 years (2019-2021). With the institutional ethical endorsement the sample was selected from the patients of the Oral and Reconstructive Implantology clinic of the UniCIEO University Foundation to undergo dental implant surgery and / or adaptation of the place where the future implants will be placed (preservation of alveoli, particulate grafts, Inlay type, Onlay type, maxillary sinus grafts laterally) or grafts with Intralift technique (crestal route) with the use of the resorbable suture of polyglycolic acid 3'0s and 4'0s (Assucryl®). Inclusion criteria: patients of both sexes, over 18 years of age, ASAI or ASAIL who were consulted their desire to participate in the study through the informed consent of this research. Patients with sensorineural limitations were excluded. After surgery, clinical controls were carried out in three periods: at 8, 15 and 30 days, assessing the presence and intensity of pain, edema, localized flushing in the surgical area, tissue confrontation and loss of points on a binary scale whether (1) or not (2). All these variables were recorded in the database, for the realization of descriptive and inferential statistics based on contingency tables and the Chi Square test.

3. Results

Total of the sample 19 patients, of which 13 were women with an average age of 60.5 years (± 7.5 years) and 6 men with an average age of 61.6 years (± 4.99 years), to whom 26 surgical procedures were performed. Personalized antibiotic prophylaxis according to the antibiogram 3 procedures and with Amoxicillin 23. Total number of implants placed 57: upper jaw 26, lower jaw 19 and bimaxillary 12. The number of implants per patient ranged from 1 to 6 (Table 1). Type of surgery with guided bone regeneration 8 patients: 3 in the upper jaw, 3 in the lower jaw and 2 in the bimaxillary, with breast graft 6 patients (Table 2) and 6 Exodontics in 3 patients. The surgical time ranged from 1 to 4 hours, the

most frequent being 2 hours (10 procedures), 1 hour (7 procedures), 3 horas (5 procedures) and 4 horas (4 procedures). The most commonly used suture techniques were: the continuous 42% and single point 31%; in upper jaw 13 procedures (50%), lower maxilla 10 procedures (38.48%) and bimaxillary 3 procedures (11.52%) (Table 3).

Table 1 Location and number of maxillary implants

1Q	Patients	Total implants	Percentage
Number			
1	4	4	7,0%
2	7	14	24,6%
3	3	9	15,8%
4	6	24	42,1%
5	0	0	0,0%
6	1	6	10,5%
Location			
Upper jaw	9	26	45,6%
Lower jaw	9	19	33,3%
Bimaxillary	3	12	21,1%
<i>n</i> =		57	100%

Table 2 Surgical procedures necessary for implant placement

Surgeries		Patients	Percentage
Guided bone regeneration			
Upper jaw		3	37,5%
Lower jaw		3	37,5%
Bimaxillary		2	25,0%
Breast grafting		6	100,0%
Exodontics	Upper jaw	3	100,0%

Table 3 Suture techniques

Suture techniques	Procedimientos	Percentage
Horizontal mattress	1	3,8%
Vertical mattress	3	11,5%
Continuous	11	42,3%
Simple	8	30,8%
In X	3	11,5%
<i>n</i> =	26	100%

The assessment of clinical symptoms could not be performed at 30 days in three patients due to the onset of the SARS-VOC 2 pandemic. The symptoms of pain, edema and flushing decreased in the clinical controls at 8, 15 and 30 days in the total sample (Table 4). There was a significant difference in the decrease in edema between the controls (Chi Square $p = 0.012$) (Pearson 0.014). The presence of flushing also showed a significant difference between the controls (Pearson $p=0.000$). There was no significant difference between the presence of tissue confrontation and the times of clinical controls (Chi square $p=0.193$), (Pearson $p=0.219$).

Table 4 Clinical symptoms during the 3 postoperative controls

Symptoms	8 days	15 days	30 days
Pain			
YES	0	0	0
NO	0	0	0
Oedema			
YES	14	9	1
NO	12	17	22
Blush			
YES	18	13	1
NO	8	13	22
Tissue confrontation			
YES	19	18	20
NO	7	8	3
Loss of points			
YES	8	8	7
NO	18	18	16
n =	26	26	23

4. Discussion

In the present study the majority of patients were older adults, who frequently present with poor oral hygiene, recurrent dental caries, apical infections, gingivitis and periodontal disease. Many of these cases are associated with systemic diseases such as diabetes or bad habits such as smoking and alcoholism consequently leading to tooth loss. The clinical symptoms of early complications in implant surgery: pain, edema and postoperative flushing were decreasing through the days (30 days), there being a significant difference in the decrease in edema and flushing that are indicative of no bacterial contamination and good healing process from 15 days post-surgery. This coincides with the study by Sortino and Guillaume (11) (12), where it was shown that the inflammatory response in oral surgery with the resorbable suture of PGA was lower than with silk favoring the healing process and the success of the implants.

In addition to the placement of dental implants, some patients needed other surgical procedures such as maxillary sinus grafting, guided bone regeneration and exodontics, but the symptoms of pain, edema and flushing disappeared in 25 of the interventions at 30 days and tissue confrontation occurred in 20 of the 23 procedures of the patients. Who attended the 30-day control, which coincides with the study where a higher healing rate was observed with the resorbable suture of polyglactin 910 (Vicryl Rapid®) than with catgut and PGA (Dexon®) (9).

The present study showed that suture integrity is directly related to infection control and scarring. The loss of stitches increases the risk of complications such as the presence of edema, flushing and pain during the first 15 days. In addition, it was shown that in a patient in whom the 4 different surgical procedures were performed in a single act, the stitches were maintained during the days following the intervention, which helped the confrontation of tissues and did not present postoperative complications.

In the present research, the loss of points was greater in the upper jaw (6 surgical frictions against 4 in the lower jaw); no studies were found to corroborate this finding. The suture technique that was most lost was the continuous one, coinciding with the study from where it was shown that the integrity of the PGA suture is compromised with the loss of the knot or any of the stitches and also Burkhardt & Lang (13), coincides with the study from where he compared the techniques of single point suture and horizontal mattress finding that the tensile strength of the single suture was almost double. Matches with the study where he compared the techniques of single point suture and horizontal mattress finding that the tensile strength of the single suture was almost double that of the horizontal mattress suture technique even though the loss of tension of the PGA shows a significant reduction of tensile force in both techniques (14).

Infection in operative procedures can be a big problem for the successful completion of surgical processes in the mouth. The different surgical procedures require an excellent management of the tissues where various factors intervene to achieve a satisfactory healing. The use of sutures that help with this objective are a fundamental point to achieve the success of the procedure and consequently the continuation of the rehabilitation treatment. Depending on the place of surgery, the suture technique to be performed must be taken into account ensuring that it is not lost until the desired healing is achieved.

5. Conclusion

The oral post-surgical healing using use of the resorbable suture of polyglycolic acid 3'0s and 4'0s, presented few biological complications at 8 days and disappeared after 30 days so its effectiveness is verified.

Compliance with ethical standards

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Disclosure of conflict of interest

All authors declare that they have no conflicts of interest.

Statement of ethical approval

The ethics committee of the UniCIEO University Foundation conferred the endorsement number 111 to the research Oral post-surgical healing with resorbable polyglycolic acid suture, classifying it as low-risk research in the minutes number 63 of August 21, 2020. The foregoing in compliance with current national regulations.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

Reference

- [1] Heitz-Mayfield LJ, Aaboe M, Araujo M, Carrión JB, Cavalcanti R, Cionca N, et al. Group 4 ITI Consensus Report: Risks and biologic complications associated with implant dentistry. *Clin Oral Implants Res.* 2018;29(May):351–8.
- [2] Selvi F, Cakarar S, Can T, Kirli Topcu Sİ, Palancioglu A, Keskin B, Bilgic B, Yaltirik M KC. Effects of different suture materials on tissue healing. *J Istanbul Univ Fac Dent.* 2016;50(1):35–42.
- [3] Banche G, Roana J, Mandras N, Amasio M, Gallezio C, Allizond V, et al. Microbial Adherence on Various Intraoral Suture Materials in Patients Undergoing Dental Surgery. *J Oral Maxillofac Surg.* 2007;65(8):1503–7.
- [4] Otten JE, Wiedmann-Al-Ahmad M, Jahnke H, Pelz K. Bacterial colonization on different suture materials - A potential risk for intraoral dentoalveolar surgery. *J Biomed Mater Res - Part B Appl Biomater.* 2005;74(1):627–35.
- [5] Grigg TR, Liewehr FR, Patton WR, Buxton TB, McPherson JC. Effect of the wicking behavior of multifilament sutures. *J Endod.* 2004;30(9):649–52.

- [6] Minozzi F, Bollero P, Unfer V, Dolci A, Galli M. The sutures in dentistry. *Eur Rev Med Pharmacol Sci.* 2009;13(3):217–26.
- [7] Selvig Knut A, Biguitti Guy R, Leknes Knut N WUME. Oral Tissue Reactions to Suture Materials. *Int J Periodontics Restor Dent.* 1998;18(5):475–87.
- [8] Balamurugan R, Mohamed Prof. M, Pandey V, Katikaneni HKR, Kumar Prof. KA. Clinical and histological comparison of polyglycolic acid suture with black silk suture after minor oral surgical procedure. *J Contemp Dent Pract.* 2012;13(4):521–7.
- [9] Gazivoda D, Pelemiš D, Vujašković G. A clinical study on the influence of suturing material on oral wound healing. *Vojnosanit Pregl.* 2015;72(9):765–9.
- [10] Shaw RJ, Negus TW, Mellor TK. A prospective clinical evaluation of the longevity of resorbable sutures in oral mucosa. *Br J Oral Maxillofac Surg.* 1996;34(3):252–4.
- [11] Sortino F, Lombardo C, Sciacca A. Silk and polyglycolic acid in oral surgery: A comparative study. *Oral Surgery, Oral Med Oral Pathol Oral Radiol Endodontology.* 2008;105(3).
- [12] Guillaume B. Les implants dentaires : revue. *Morphologie [Internet].* 2016;100(331):189–98. Available from: <http://dx.doi.org/10.1016/j.morpho.2016.02.002>
- [13] Burkhardt R, Lang NP. Influence of suturing on wound healing. *Periodontol 2000.* 2015;68(1):270–81.
- [14] Taysi AE, Ercal P, Sismanoglu S. Comparison between tensile characteristics of various suture materials with two suture techniques: an in vitro study. *Clin Oral Investig.* 2021;25(11):6393–401.