Clin Oral Invest (2008) 12:287–290
DOI 10.1007/s00784-007-0160-x

SHORT COMMUNICATION

Evaluation of sutures after immersion in nonalcoholic benzydamine hydrochloride mouthrinse by scanning electron microscopy

Gisele da Silva Dalben · Leda Aparecida Francischone · Paula Prieto-Oliveira · Alberto Consolaro

Received: 13 March 2007 / Accepted: 15 October 2007 / Published online: 10 November 2007

Abstract This study evaluated the surface integrity of sutures after immersion in mouthrinse or water, by scanning electron microscopy (SEM) analysis. Pieces of resorbable suture remaining after oral surgery were immediately collected. Twelve pieces each of catgut, chromed catgut, and polyglactin 910 were divided into four groups and immersed in pure mouthrinse, mouthrinse diluted in water at 1:1 and 1:2, or water (positive control), for 24 h. Three pieces each of new sutures were used as negative control. Specimens were placed on stubs and sputter coated with gold for SEM analysis. Observation of experimental groups and comparison with controls revealed that immersion in the mouthrinse at different dilutions did not alter their surface; slight, nonsignificant changes were found in some experimental specimens yet also in the positive control group. It was concluded that immersion of resorbable sutures in water or non-alcoholic benzydamine hydrochloride mouthrinse did not produce any significant change; therefore, this mouthrinse may be safely employed after oral surgery.

Keywords Resorbable sutures · Oral antiseptics · Oral surgery · Postoperative care · Oral hygiene

G. da Silva Dalben
Hospital for Rehabilitation of Craniofacial Anomalies,
University of São Paulo,
Bauru, Brazil

L. A. Francischone
University of Sagrado Coração,
Bauru, Brazil

P. Prieto-Oliveira
Dental School, Federal University of Uberlândia,
Uberlândia, Brazil

A. Consolaro
Bauru Dental School, University of São Paulo,
Bauru, Brazil

G. da Silva Dalben (✉)
Departamento de Estomatologia, Disciplina de Patologia Bucal,
University of São Paulo,
Al. Octávio Pinheiro Brisolla, 9-75 Vila Universitária,
17012-901 Bauru, SP, Brazil
e-mail: gsdalben@usp.br

Introduction

One of the main problems after maxillofacial surgery is the accumulation of microbial biofilms on the surface of teeth and oral mucosa, as well as on the surgical wound and sutures. Mouthrinses may effectively help with oral hygiene control in the postoperative period [4, 6]; they may be alcoholic or nonalcoholic, yet the latter is more comfortable to the patient. Both may be used after surgery, either pure or diluted with water [5]. The efficiency of antiseptic mouthrinses is related to the concentration of their active substance yet not to their diluents; among these, alcohol is the most often employed in mouthrinses.

Antiseptic mouthrinses are important for oral hygiene control because of their anti-inflammatory, analgesic, antipyretic, local anesthetic, and antimicrobial properties [9] and may also be used by children [2].

The chemical action of mouthrinses on the composition, resistance, and time of degradation of sutures is not fully known. Despite some evidences that chlorhexidine mouthrinses do not have any influence on polyglactin 910 suture [6], many professionals do not indicate utilization of any mouthrinse because of the fear that they might cause early degradation of resorbable sutures.

Therefore, this study evaluated fragments of sutures after immersion in benzydamine hydrochloride mouthrinse or water, by scanning electron microscopy (SEM) analysis.

Materials

Pieces of resorbable sutures remaining after surgery were collected at a hospital immediately after lip and palate surgery, secondary bone graft, or ears–nose–throat surgery in the mouth. The surfaces of sutures were analyzed, regardless of their diameter. The sutures analyzed in this study were catgut, chromed catgut, and polyglactin 910, manufactured by Ethicon® (Johnson & Johnson, Brazil). The mouthrinse employed was Flogoral® (Asta Medica, Brazil). The fragments of sutures were distributed according to the type of suture and solution, as demonstrated in Table 1.

All sutures were kept immersed for 24 h. After this period, they were dried with absorbent paper. Three further fragments of new sutures not immersed in any solution were used as a negative control.

The fragments of sutures were then placed on steel stubs, sputter coated with gold,[1] and analyzed by SEM.[2] Analysis was performed by observation of negative and positive control groups, considering the surface integrity, presence of irregularities, presence of debris, distance between filaments, and loss of the bonding substance that joins the filaments.

Results

Morphological comparison between specimens and positive and negative controls revealed that the mouthrinse at different dilutions did not alter their surface when analyzed by SEM. Slight surface irregularities were observed in some specimens yet in all groups and thus were interpreted as structural variables of sutures originated during the manufacturing process.

The monofilament characteristic of catgut suture could be observed; the suture seemed to be covered by an irregular substance with small, needle-shaped structures (Fig. 1a). After immersion in water, debris were deposited on the suture surface, and the length of these surface structures was somewhat reduced (Fig. 1b). Similar aspect was also observed after immersion in mouthrinse diluted in water at 1:2 or 1:1 or pure, yet the suture surface seemed to be slightly smoother in these cases (Fig. 1c, d, and e, respectively).

[1] Hammer VI Sputtering System, Anatech, Alexandria, USA

[2] Jeol model JSM-T220A, Tokyo, Japan

Table 1 Distribution of the study groups

Sutures	Solution	*N*
Catgut (*n*=15)	1a. Unused suture (negative control)	3
	1b. Immersion in water (positive control)	3
	1c. Immersion in mouthrinse diluted in water at 1:2	3
	1d. Immersion in mouthrinse diluted in water at 1:1	3
	1e. Immersion in pure mouthrinse	3
Chromed catgut (*n*=15)	2a. Unused suture (negative control)	3
	2b. Immersion in water (positive control)	3
	2c. Immersion in mouthrinse diluted in water at 1:2	3
	2d. Immersion in mouthrinse diluted in water at 1:1	3
	2e. Immersion in pure mouthrinse	3
Polyglactin 910 (*n*=15)	3a. Unused suture (negative control)	3
	3b. Immersion in water (positive control)	3
	3c. Immersion in mouthrinse diluted in water at 1:2	3
	3d. Immersion in mouthrinse diluted in water at 1:1	3
	3e. Immersion in pure mouthrinse	3

The chromed catgut suture exhibited typical twisted configuration with narrow grooves between filaments and also seemed to be covered by a bonding substance, yet with more regular surface compared to catgut (Fig. 2a). The same aspect was observed after immersion in water (Fig. 2b) and in mouthrinse diluted at 1:2 and 1:1 (Fig. 2c and d, respectively). The sutures immersed in pure mouthrinse presented similar aspects, yet more debris were adhered to the suture surface (Fig. 2e).

Analysis of new pieces of polyglactin 910 revealed peculiar braided aspect with narrow grooves between filaments, which were richly covered by a bonding substance (Fig. 3a). Immersion in water (Fig. 3b) and in mouthrinse diluted at 1:2 or 1:1 or pure (Fig. 3c, d, and e, respectively) reduced the amount of this bonding substance; the grooves between filaments were slightly wider. Furthermore, sutures immersed in mouthrinse exhibited larger amount of debris adhered to the surface.

Discussion

Adhesion of debris on the surface of used sutures corroborates the findings of Otten et al. [7] and Parirokh et al. [8], who demonstrated remarkable microbial colonization on specimens. This further stresses the need of careful oral hygiene control after oral surgery [1, 5]. Recently introduced sutures with antibacterial properties may also constitute an important tool in this aspect [3].

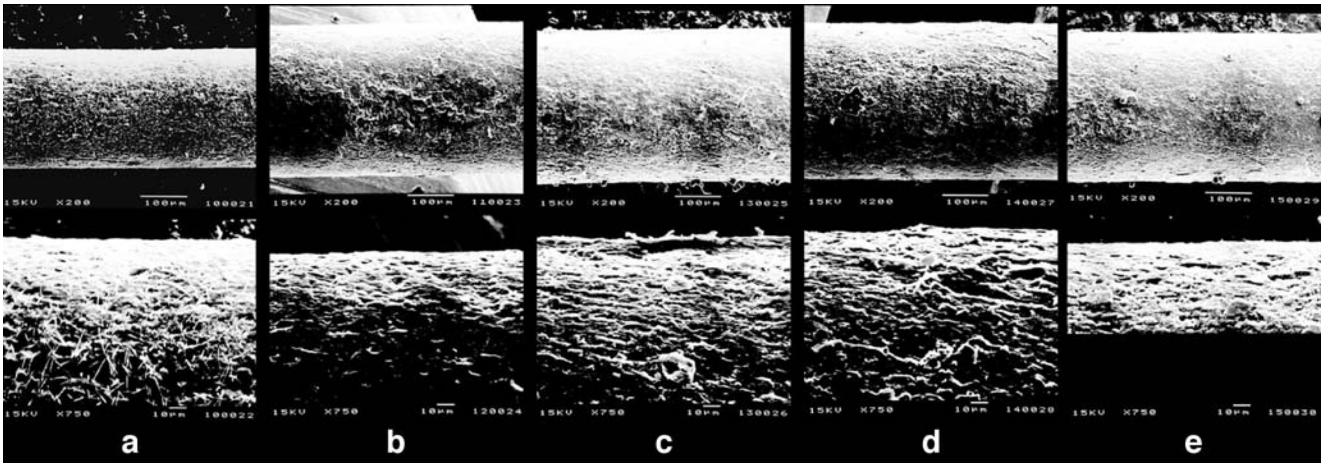

Fig. 1 Catgut suture. **a** Unused suture; note the monofilament structure covered by an irregular substance with small, needle-shaped structures. **b** Immersion in water; observe the reduction in length of surface structures and deposition of debris. **c** Immersion in mouthrinse diluted at 1:2, **d** immersion in mouthrinse diluted at 1:1, and **e** immersion in pure mouthrinse; in addition to deposition of debris, the surface appears slightly smoother. *Upper row*, ×200 magnification; *lower row*, ×750 magnification

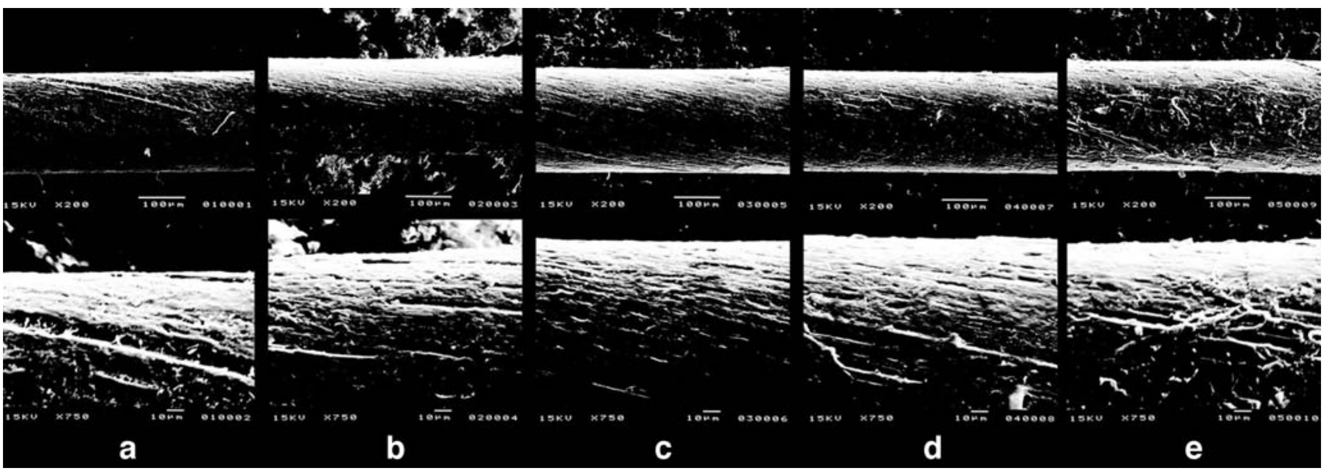

Fig. 2 Chromed catgut suture. **a** Unused suture; observe twisted configuration with more regular surface aspect and grooves between filaments; note the bonding substance joining the filaments and in the grooves at higher magnification. **b** Immersion in water, **c** immersion in mouthrinse diluted at 1:2, and **d** immersion in mouthrinse diluted at 1:1; similar aspect as in **a**. **e** Immersion in pure mouthrinse; more debris are adhered to the surface. *Upper row*, ×200 magnification; *lower row*, ×750 magnification

Fig. 3 Polyglactin 910 suture. **a** Unused suture; note braided aspect, narrow grooves between filaments, and rich coverage by a bonding substance at higher magnification. **b** immersion in water, **c** immersion in mouthrinse diluted at 1:2, **d** immersion in mouthrinse diluted at 1:1, and **e** immersion in pure mouthrinse; observe the reduced amount of the bonding substance and wider grooves between filaments. On **c**, **d**, and **e**, note the larger amount of debris adhered to the surface. *Upper row*, ×200 magnification; *lower row*, ×750 magnification

The mild changes observed on the surface aspect of sutures after immersion in water or mouthrinse do not support any assumption that mouthrinsing with such products after oral surgery might trigger or accelerate suture degradation or cause postoperative problems such as suture dehiscence. The surfaces of sutures immersed in the mouthrinse were similar as those observed after immersion in water.

The surfaces of all sutures were uniform in all groups yet irregular, presenting gaps and spaces between filaments, thus explaining the occurrence of microbial colonization and formation of microbial biofilms on their surface. These findings reinforce the importance of postoperative oral antisepsis with utilization of mouthrinses, in an attempt to reduce the presence of biofilms on the sutures.

The sutures selected for testing, as well as the mouthrinse, were the most often employed in oral surgery in Brazil. Although no surface changes were observed on the sutures after immersion in the mouthrinse, the effect of other mouthrinses on different types of sutures should be investigated. Future studies should evaluate the effect of commercially available, nonalcoholic triclosan and chlorhexidine solutions.

Considering that the surface was intact in all study groups, no mechanical changes would be expected. However, the mechanical resistance of these sutures under the same study conditions should also be investigated by tensile strength testing to provide objective data on this subject.

In summary, immersion of resorbable sutures in water and in nonalcoholic benzydamine hydrochloride mouthrinse at different concentrations did not produce any significant change; thus, this mouthrinse may be safely employed as an antiseptic in the postoperative period after oral surgery.

Acknowledgments The authors would like to thank the nursing staff of the surgery service of HRAC/USP, herein represented by nurse MSc Janir Biazon, for the help in collection of remnants of sutures, and Edimauro de Andrade, for his help with utilization of the scanning electron microscope.

References

1. Brown AR, Papasian CJ, Shultz P, Theisen FC, Shultz RE (1998) Bacteremia and intraoral suture removal: can an antimicrobial rinse help? JADA 129:1455–1461
2. Cheng KKF (2004) Children's acceptance and tolerance of chlorhexidine and benzydamine oral rinses in the treatment of chemotherapy-induced oropharyngeal mucositis. Eur J Oncol Nurs 8:341–349
3. Ford HR, Jones P, Gaines B, Reblock K, Simpkins DL (2005) Intraoperative handling and wound healing: controlled clinical trial comparing coated Vicryl plus antibacterial suture (coated polyglactin 910 suture with triclosan) with coated Vicryl suture (coated polyglactin 910 suture). Surg Infect 6:313–321
4. Leknes KN, Selvig KA, Boe OE, Wikesjo UME (2005) Tissue reactions to sutures in the presence and absence of anti-infective therapy. J Clin Periodontol 32:130–138
5. Lockhart PB, Schmidtke MA (1994) Antibiotic considerations in medically compromised patients. Dent Clin North Am 38:381–402
6. McCaul LK, Bagg J, Jenkins WMM (2000) Rate of loss of irradiated polyglactin 910 (Vicryl Rapide) from the mouth: a prospective study. Br J Oral Maxillofac Surg 38:328–330
7. Otten JE, Wiedmann-Al-Ahmad M, Jahnke H, Pelz K (2005) Bacterial colonization on different sutures materials—a potential risk for intraoral dentoalveolar surgery. J Biomed Mater Res Part B Appl Biomater 74B:627–635
8. Parirokh M, Asgary S, Eghbal MJ, Stowe S, Kakoei S (2004) A scanning electron microscope study of plaque accumulation on silk and PVDF suture materials in oral mucosa. Int Endod J 37:776–781
9. Turnbull RS (1995) Benzydamine hydrochloride (Tantum) in the management of oral inflammatory conditions. J Can Dent Assoc 61:127–134