

# Is Implant Flossing a Risk-Free Procedure? A Case Report with a 6-year Follow-up

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*This study reports a case of peri-implantitis correlated with floss fibers trapped by the implant-prosthetic macrostructure. Discrepancy between the radiographic feature and probing depth was the starting point for a correct evaluation. The minimally invasive removal of the trapped material with the aid of a periodontal endoscope resulted in a complete resolution of the peri-implantitis with a stable long-term result (6 years). This case report argues for some reconsiderations in hygienic, diagnostic, and therapeutic approaches in oral implantology. INT J ORAL MAXILLOFAC IMPLANTS 2016;31:e79–e83. doi: 10.11607/jomi.4263*

**Keywords:** diagnosis, endoscopy, floss, nonsurgical therapy, peri-implantitis

**P**eri-implant mucositis and peri-implantitis are diseases that originate from indigenous bacteria. Diseases occur when the balance between the host and microbiota is disrupted, particularly in a susceptible host or when the microorganism is highly pathogenic.

While peri-implant mucositis describes the inflammation of the peri-implant mucosa with no signs of bone loss, peri-implantitis is characterized by the loss of supporting bone around a failing but functional implant.<sup>1</sup>

A correct diagnosis is critical for appropriate management of peri-implant disease.<sup>2</sup> Bleeding on probing is always present with peri-implant disease. Other clinical signs of disease may include suppuration, increased probing depths relative to baseline, mucosal recession, draining sinus (fistula), and peri-implant mucosal swelling/hyperplasia. If undiagnosed, peri-implant disease may lead to complete loss of osseointegration and implant loss.

Probing is essential for diagnosis of peri-implant disease. The probing depth, the presence of bleeding on probing, and suppuration should be assessed regularly

for the diagnosis of peri-implant diseases. Intraoral radiographs are equally required to monitor the implant supporting bone.

Overall, peri-implant diseases can be considered a consequence of insufficient oral hygiene; hence, the implant rehabilitation must always be associated with a strict hygiene motivation. Many tools are available for implant home care, and floss is one of the most routinely suggested. The “implant floss” is commonly represented by spongy, thick, unwaxed, and flexible floss generally composed of stretchy fibers.

This work describes a clinical case of peri-implantitis where regular implant flossing can be recognized as the unexpected main inductive factor of the pathologic manifestation.

## CASE REPORT

A man of 66 years of age was referred to the authors' division with the early diagnosis of “recurrent peri-implant mucositis” to four interforaminal implants.

The chief complaint was chin pain and recurrent swelling with spontaneous bleeding around four mandibular dental implants.

One year earlier, the patient had a comprehensive oral rehabilitation with two total dentures, the lower one stabilized by means of an implant bar. The patient's radiographic documentation showed a correct bone level around each implant at the time of rehabilitation (Fig 1).

During the visit, in spite of very few plaque deposits, clear signs of mucosal inflammation were detected around the implants (Fig 2). A painful probing failed to detect pathologic values in contrast with radiographic signs of peri-implant bone resorption (Fig 3). A microbiologic test was performed, and a second visit was scheduled a week later. The patient was instructed to use an antiinflammatory

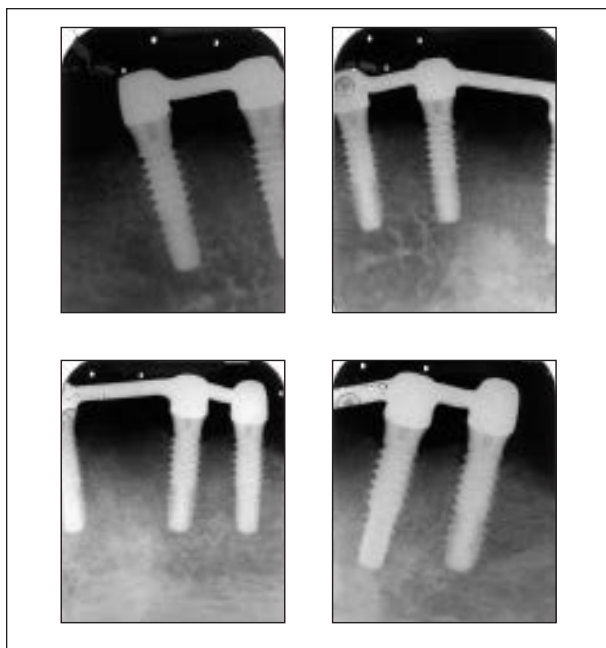
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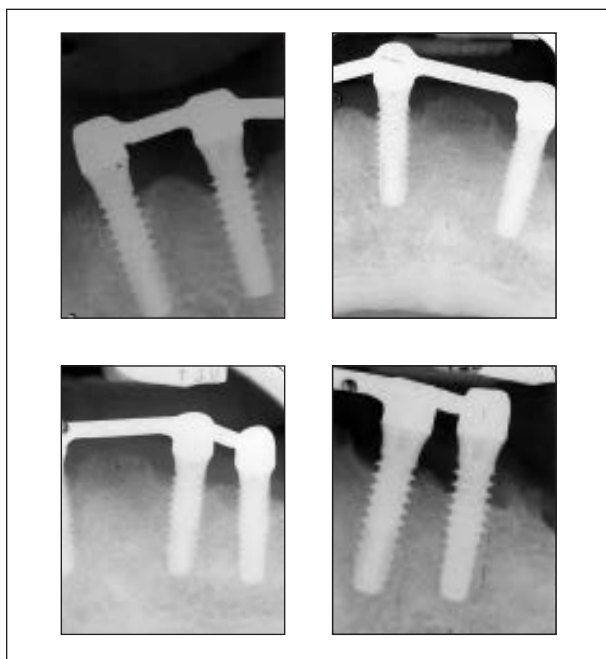
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**Fig 1** Radiographic exam at time of rehabilitation: the bone level reaches the first implant thread of each implant.



**Fig 3** Radiographic exam at first visit: bone resorption with typical "cup shape" is observable around each implant.

oral rinse twice a day (Oki sol, ketoprofen lysine salt 1.6%, Dompè SpA) and to regularly compress the peri-implant mucosa by means of a rubber tip (Sunstar GUM), under topical applications of chlorhexidine gel (Dentosan periodontal gel 0.5%, J&J).

At the next visit, the symptoms and inflammatory signs were not entirely resolved, though; reduced oedema allowed partial visualization of a trapped yellowish



**Fig 2** Clinical aspect at first visit: signs of peri-implant mucositis can be seen around each implant.

filamentous material around one implant (Fig 4). To investigate this clinical observation, a perioscopy seat was started (DV2 Perioscopy system, Dentalview). After a topical anesthesia (Oraqix, Dentsply) was applied, the endoscopical fiber was gently inserted between the implants and mucosa, disclosing a diffuse presence of the filamentous foreign body around each implant (Fig 5). After obtaining a clear visualization of the trapped material, it was meticulously removed. The peri-implant probing after this procedure detected pathologic values ranging from 6 to 8 mm, data more congruent with the initial radiographic figure. A sample of the material removed was formalin fixed and processed for electron microscopy. The analysis showed a composed filamentous material embedded in an "organic mud" rich in bacterial cells (Fig 6). A comparative analysis with the spongy floss routinely used by the patient (Super floss Oral-B, P&G) showed overlapping features (Fig 7). As a consequence, the patient was instructed to totally suspend it and use only end-tufted brushes (Curaprox, Curaden International). The microbiologic exam detected high rates of the main periodontal pathogens (bacterial load: *Porphyromonas gingivalis*  $1.15 \times 10^5$ , *Tannarella forsythensis*  $5.89 \times 10^4$ , *Treponema denticola*  $1.4 \times 10^5$ ). A final diagnosis of "peri-implantitis predisposed by trapped floss fleches" was expressed.

At 10 days, a complete remission was observed; therefore, regular 3-month controls with debridement were scheduled.

After 1 year of clinical stability and absence of any symptoms, the patient was radiographically and microbiologically reexamined. The marginal bone was stable with a clear lamina dura (Fig 8). A microbiologic test showed a microbial flora typical of periodontal health (absence of periodontal pathogens). Probing depth returned to physiologic values in absence of bleeding, while the tissue contraction led to a partial implant exposure. The clinical case was considered resolved, so conventional maintenance was started. Six years later, clinical-radiographic examination confirmed stability of the case (Figs 9 and 10).

The present work followed the Helsinki Declaration statement.

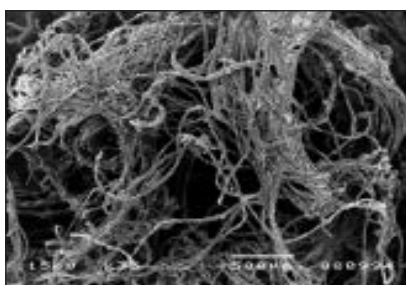


**Fig 4** Second visit: yellowish filaments become visible around implant in the right mandibular first premolar.

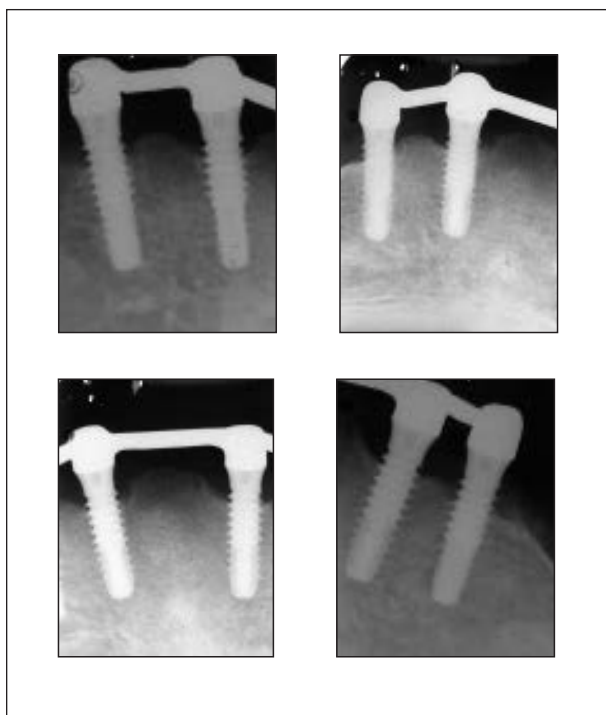
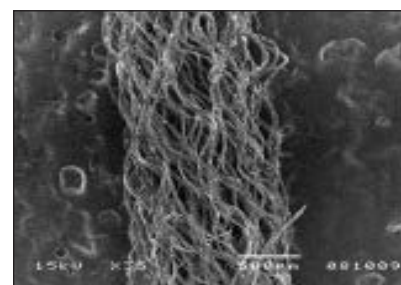


**Fig 5** Endoscopic fiber inserted between the implant surface and peri-implant mucosa.

**Fig 6 (left)** Electron microscopy vision of the foreign body: filaments of regular diameter are chaotically organized and embedded in an "organic mud".



**Fig 7 (right)** Electron microscopy vision of the spongy floss regularly used for implant hygiene by the patient: the filaments have very similar dimension and shape to those removed around implants.

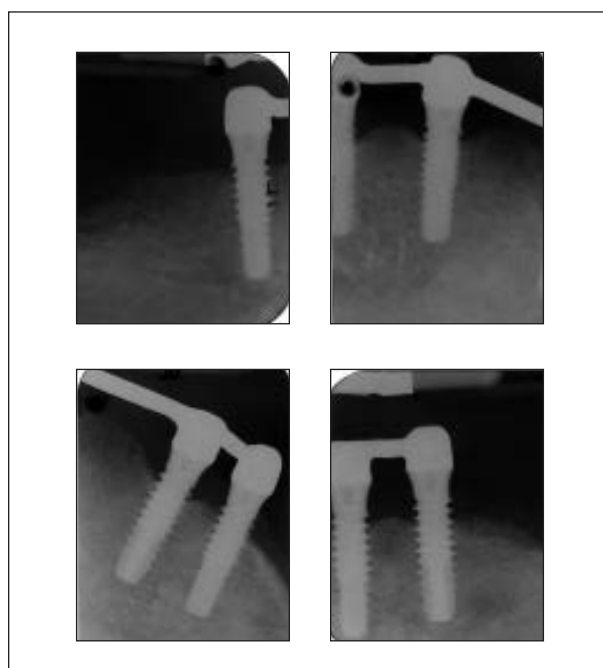


**Fig 8 (above)** Radiographic examination at 1 year after treatment: marginal bone remodeling has occurred, maintaining a stable level around implants.

**Fig 9 (above right)** Clinical aspect at 6 years after treatment: healthy and stable soft tissues are observable.



**Fig 10 (right)** Radiographic exam at 6 years after the treatment: the marginal bone around implants is stable.





## DISCUSSION

The present case report describes a peri-implantitis that was probably exacerbated by accidental retention of floss residues.

The tissue damages were in all probability the consequence of the trapped material, which acted as a foreign body and also as a reservoir for periodontal pathogenic bacteria.

In 1983, the first clinical case report about retained pieces of dental floss and consequent periodontal reaction was published.<sup>3</sup> To the best of the authors' knowledge, the present work is the first one regarding implantology.

This case report presents strong similarities to experimentally induced peri-implantitis on animal models.<sup>4,5</sup> In such models, cotton ligatures are placed submarginally around implants and allowed to accumulate plaque. This procedure results in inflammation and breakdown of peri-implant soft and hard tissues. A comparative study about ligatures on teeth and implants showed that clinical and radiographic signs of tissue destruction are more pronounced around implants than teeth. Moreover, the size of the soft tissue lesion is larger at implants than at teeth, and only the peri-implant lesion extends into the bone marrow.<sup>6</sup>

Marinello et al showed that at 3 months after the removal of such ligatures, in some animals and sites, the peri-implantitis lesions became encapsulated by a dense collar of fibrous connective tissue. In other sites, however, the tissue destruction continued, and the extensive loss of bone caused exfoliation of the implants.<sup>7</sup> The reason that some peri-implantitis lesions are associated with extensive bone loss and others with minor bone loss is not currently understood, but it may be related to differences between implant sites regarding the submarginal microbiota, or the quality of the host's response to the infection.<sup>8,9</sup>

Ordinarily, many specialists have prescribed "spongy floss" for implant care, but this tool has an unapparent risk.<sup>10,11</sup> The implant hazard described here has never been reported before, except for a very brief hint in a 2003 review.<sup>12</sup> To achieve a submucosal debridement, the implant floss is generally used by crossing over the ends of it, encircling the implant and apically directing the ends with a shoeshine motion to penetrate the sulcus of the peri-implant mucosa. Plausibly, the macromorphology of the implant as the eventual misfit of the prosthetic connections can potentially tear the floss, finally trapping fibers. In light of this observation, single thread floss or braided floss may be safer since they have a reduced risk of leaving eventual residues. Alternatively, a water flosser seems to be a good substitute to implant flossing.<sup>13</sup>

The present case report reinforces the importance of radiographic examination associated with clinical observation for implantology. Because of the probing limitation induced by floss tangles, the preliminary diagnosis based only on clinical data failed to identify the peri-implantitis. Thanks to radiographs, it was actually possible to identify a clear discrepancy between the bone level and probing.

The use of the periodontal endoscope was very helpful for both diagnosis and treatment. A peculiar indication of this facility in the present case derives from many factors such as submarginal localization, small dimension, and radiotransparency of the residues. Indeed, the endoscope gives the clinician a direct, real-time, and magnified visualization of the submarginal area with a minimally invasive approach.<sup>14,15</sup> For these reasons, it was possible to identify the trapped foreign body and completely remove it. This minimally invasive approach is extremely welcome by the patient and offers a better preservation of the soft tissues with potential benefits in the quality and time of the healing process.<sup>16</sup>

The complete long-term resolution of the pathologic signs and the patient symptoms reinforces the study hypothesis. The accurate removal of the trapped floss, supported by a rigorous hygienic maintenance, has actually been sufficient to stabilize the peri-implant bone loss. Interestingly, the initial high rates of periodontal pathogens completely disappeared after the therapeutic approach. It derives that the foreign body was the main substrate for their proliferation, while these bacteria did not significantly colonize the implant surface.

During the follow-up of the present case, it was observed that after an initial remodeling, a good long-term stability of the peri-implant bone was obtained, but no significant regrowth of bone was recorded in the present work. This observation differs from a recent case series where some radiographic bone fill of the peri-implant defects was recorded following non-surgical treatment.<sup>17</sup> There is scarce evidence on the radiographic response following nonsurgical therapy in peri-implantitis cases. Treatment of dental implant-associated infections conventionally consists of an anti-infective protocol that can be achieved through mechanical debridement of the implant surface or chemical treatment including local and systemic antibiotics.<sup>18</sup> However, nonsurgical treatment of sites with peri-implantitis was not found to be effective at reducing inflammation, pathogenic microorganisms, and bleeding on probing.<sup>19</sup> The addition of an antimicrobial mouthrinse during nonsurgical treatment of peri-implantitis only provided minimal beneficial effects.<sup>20</sup> A better response seems to emerge from studies with the use of local or systemic antibiotics.<sup>21</sup> The use of

local drug delivery such as minocycline and tetracycline to treat peri-implantitis has generated reduced levels of *T forsythia*, *P gingivalis*, and *T denticola*, with the greatest effect on *A actinomycetemcomitans*.<sup>22</sup> Other works have investigated the effect of antimicrobial therapy on ligature-induced lesions and the bone response following treatment.<sup>23,24</sup> The findings disclosed that the inflammatory lesion was resolved, and new bone formation had occurred in the previous defect following antimicrobial and local therapy. The amount of “reosseointegration” that took place was, however, small. Indeed, in all experimental implant sites, a thin connective tissue capsule was found to separate the implant surface from the newly formed bone. There are several variables able to influence the peri-implant bone response to the nonsurgical therapy, such as individual response, pathogenic microflora, entity and shape of peri-implant bone defect, subgingival instrumentations used, local/systemic antibiotics, implant surface, etc. More investigations controlling these variables are needed.

Finally, in the present case report, the discrepancy between probing and radiographic bone level has been the main reason for deepening the investigation. The presence of an important amount of floss residues has helped the right diagnosis. As a consequence, it can be speculated that a smaller entity, sufficient for the biologic reaction but not for the probing impediment, associated to its radiotransparency and very tiny dimension, would have probably induced a mere diagnosis of “general” peri-implantitis.

In conclusion, within the limits of a case report, the present work argues for new considerations about the potential drawbacks of spongy floss in implant hygienic care, as for diagnosis and treatment of peri-implantitis. Further investigations are strongly needed.

## ACKNOWLEDGMENTS

The authors would like to thank Dr Marchionni Silvia for the electro-microscopic examination. The authors reported no conflicts of interest related to this study.

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