

# High-Power Diode Laser for Second-Stage Implant Surgery in an Anticoagulated Patient: A Clinical Case Letter

Ricardo Yudi Tateno, DDS, MSc<sup>1</sup>  
 Luiz Felipe Palma, DDS, PhD<sup>2,3</sup>  
 Wilson Roberto Sendyk, DDS, PhD<sup>1</sup>  
 Luana Campos, DDS, PhD<sup>1,4\*</sup>

## INTRODUCTION

The number of anticoagulated patients has been increasing over the years, especially after the introduction of new direct oral anticoagulant (DOAC) drugs, for example, vitamin K antagonists (warfarin), thrombin inhibitor (dabigatran), and factor Xa inhibitors (rivaroxaban, apixaban, and edoxaban).<sup>1-3</sup>

The decision to have patients receiving long-term oral anticoagulant therapy to undergo invasive procedures is still a matter of heated debate in the literature. Should doctors continue, modify, or interrupt anticoagulation intake? It is not a simple question to answer. In general, some factors must be taken into account, such as the type of dental procedure (expected bleeding), medical background (risks of bleeding and thromboembolism), and availability of local and systemic hemostatic measures.<sup>2</sup>

Cessation or reduction of anticoagulants for some days before dental procedures may make patients vulnerable to thromboembolism, especially those at high risk. Therefore, some researchers suggest performing tooth extractions in anticoagulated patients only if they present satisfactory international normalized ratio values and local hemostatic agents are used.<sup>4</sup>

In the oral surgery field, scientific evidence on the management of DOAC-treated patients has still been weak,<sup>5</sup> since it was first investigated in 2012.<sup>6</sup> Thus, this condition is considered quite challenging due to the lack of well-established guidelines and high-quality studies.<sup>6</sup> In oral implantology, the second-stage surgery, usually performed with scalpels, may represent a risk to DOAC-treated patients. Furthermore, because of postoperative pain and bleeding, analgesic medications and strict monitoring are generally required.<sup>7</sup>

Monopolar electrosurgery, another popular soft tissue modality used in dentistry as it is capable of easily incising soft tissues with good hemostasis,<sup>8</sup> is generally contraindicated in implant procedures.<sup>9</sup> It is believed that such electrocauteries should never be used in the proximity of dental implants and

implant prostheses because of sparking, current spread, and heat generation, which may result in implant loss.<sup>9</sup>

High-power lasers (HPLs) have been widely used for periodontal tissue management and in several procedures in implantology.<sup>8</sup> The advantages of HPLs over conventional surgery (ie, scalpels) for soft tissues include disinfection, detoxification, biostimulation, and efficient hemostasis<sup>8</sup>; however, there is not enough scientific evidence on the benefits of HPLs for this group of patients.

In light of these facts, in this article we report a case that includes the use of an HPL for second-stage implant surgery in a DOAC-treated patient with an uncommon condition.

## CASE DESCRIPTION

A 60-year-old woman with hereditary thrombophilia by Factor V Leiden, acquired thrombophilia by antiphospholipid antibody syndrome, and some psychiatric disorders presented with smile dissatisfaction relating to a temporary partial removable prosthesis installed for maxillary central incisor replacement (tooth 11) (Figure 1a). She reported that a titanium implant (Osteotit Tapered Implant, diameter 4 mm, length 11.5 mm, BIOMET 3i, Palm Beach Gardens, Fla) had been installed some months earlier, at the same appointment in which the tooth had been extracted. Furthermore, although her anticoagulant medication was discontinued 4 days before the surgery, she had experienced excessive, prolonged bleeding.

The patient was on rivaroxaban therapy (10 mg, once a day) for the thrombophilic conditions. She was also taking topiramate (25 mg, once a day), fluoxetine (20 mg, once a day), and alprazolam (sporadically) for psychiatric disorders.

Given the patient's notable history of oral bleeding, it was decided to use an 808 nm diode laser (Thera Lase Surgery, DMC Ltda, São Carlos, Brazil) as an alternative to the conventional scalpel technique for the second-stage implant surgery. No medication was interrupted or modified perioperatively. The laser light was delivered in continuous-wave mode with a 400- $\mu$ m optical fiber and output power at 1.5 W (Table). There was no considerable bleeding, and a highly satisfactory transoperative visualization was achieved (Figure 1b). Thus, the surgical time did not exceed 3 minutes (Figure 1c).

On the seventh postoperative day, the patient reported neither bleeding nor pain during that week. She also showed satisfactory peri-implant tissue healing (Figure 1d), so the impression could be taken (open-tray technique with vinyl

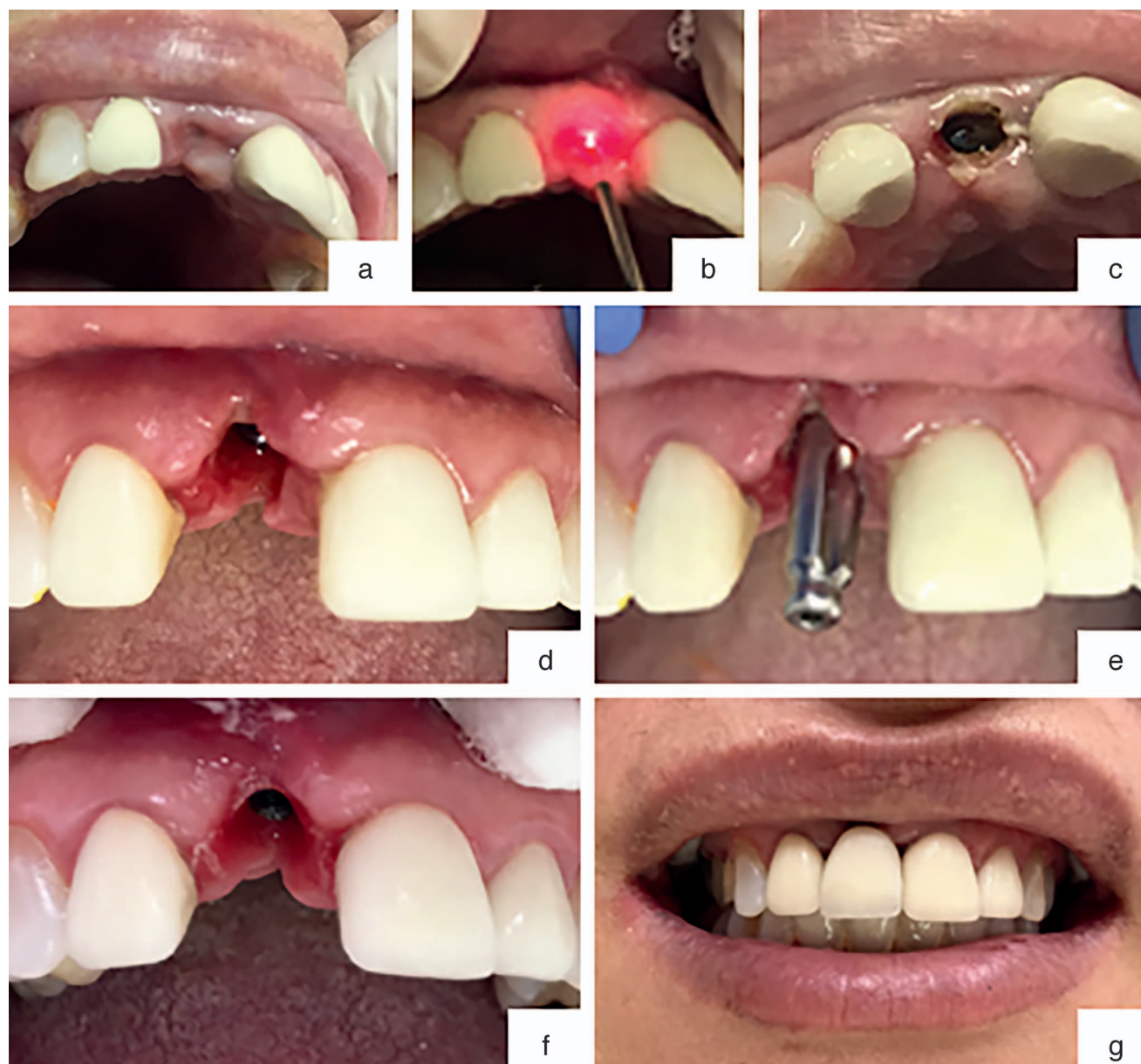
<sup>1</sup> Department of Post-Graduation in Implantology, School of Dentistry, University of Santo Amaro. São Paulo, SP, Brazil.

<sup>2</sup> Department of Morphology and Genetics, Federal University of São Paulo. São Paulo, SP, Brazil.

<sup>3</sup> MSc Program, Ibirapuera University. São Paulo, SP, Brazil.

<sup>4</sup> Oral Medicine, Brazilian Institute of Cancer Control. São Paulo, SP, Brazil.

\* Corresponding author, e-mail: lucampos@prof.unisa.br  
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**FIGURE 1.** Clinical evaluation. (a) Initial clinical presentation. (b) Laser-assisted surgery: transoperative procedures. (c) Laser-assisted surgery: immediate postoperative result. (d) Clinical presentation on the seventh day. (e) Implant impression taken on the seventh day. (f) Clinical presentation on the 15th day. (g) Final clinical presentation: metal-ceramic implant-supported fixed crown installed.

TABLE	
Parameters of the high-power laser used for second-stage implant surgery	
Laser Parameters	
Type of laser	Diode laser
Emission mode	Continuous
Time	Total time: ≈3 minutes
Spot diameter at FOC	400 μm
Peak power	1.5 W
Water irrigation	No
Air and aspirating airflow	No

polysiloxane; Figure 1e). Within 15 days, the peri-implant tissue remained satisfactory (Figure 1f), and a metal-ceramic implant-supported fixed crown retained by cement to an abutment (BIOMET 3i) was installed successfully (Figure 1g).

The patient is under a follow-up period of about 2 years, with excellent esthetics and function at the oral site.

#### DISCUSSION

In this article we report the successful use of an HPL for second-stage implant surgery in a patient on rivaroxaban therapy as a treatment for a rare condition (2 thrombophilias concomitantly) and with a recent history of notable bleeding related to an

immediate implant placement. The patient's anticoagulation medication was interrupted a few days before that the procedure.

Factor V Leiden is a genetic condition that affects the mechanisms of blood clotting due to mutation-related resistance to activated protein C.<sup>10</sup> The antiphospholipid antibody syndrome is an autoimmune condition that comprises arterial and/or venous thrombosis and/or pregnancy morbidity in the presence of antiphospholipid antibodies.<sup>11</sup> Curiously, Factor V Leiden and antiphospholipid antibody syndrome are the most frequent causes of hereditary and acquired thrombophilias, respectively; however, the combination of conditions is rare and seems to synergistically induce hypercoagulability,<sup>10</sup> dramatically increasing the likelihood of thromboembolic events and, thus, the need for nonstop anticoagulation therapy.<sup>12</sup> In the current case report, the surgeon faced a challenging decision about whether to interrupt the patient's anticoagulant medication. Discontinuing the anticoagulant medication would be a major risk to the patient's life, whereas performing an invasive procedures with the medication would pose a significant risk of bleeding.

Oral surgeries deserve important attention in DOAC-treated patients, mainly because oral soft tissues have many small vessels and capillaries, which are injured during the procedure. However, depending on beam types and power density, HPLs can seal blood vessels up to 0.5 mm in diameter and achieve instantaneous hemostasis.<sup>13</sup>

One of the first clinical cases reported on the matter suggested the use of a CO<sub>2</sub> laser for acute pericoronitis in a patient with hemophilia. According to the authors, the infusion of Factor VIII was not required preoperatively or postoperatively.<sup>14</sup> Recently, a lip frenectomy surgery model was used in anticoagulated rats to compare the use of scalpels with an HPL. As complete hemostasis was only promoted by the HPL, it was suggested that HPL could offer an alternative solution to intraoperative and postoperative bleeding in anticoagulated patients.<sup>12</sup>

Despite several clinical advantages, HPLs have been thought to present clinical disadvantages, such as the high price and need for operator training.<sup>15</sup> Considering second-stage implant surgery specifically, sufficient keratinized tissues around the implant<sup>16</sup> and previous knowledge of the implant localization are required,<sup>17</sup> yet direct damage to the implant surface topography<sup>18</sup> and bone overheating may occur.<sup>19</sup>

Although diode lasers do not seem to damage the titanium surface, heat may be generated on peri-implant bone tissue in certain situations.<sup>20</sup> On the other hand, Fornaini et al<sup>15</sup> found that an 810-nm diode laser (3 W, 4.246 J/cm<sup>2</sup>, optical fiber of 300 μm in contact with the target tissue) poses no risks of dangerous thermal elevation to the tissues and implants when the recommended parameters are adopted. Likewise, the same laser device and parameters used in the current study have been successfully applied by other researchers for second-stage implant surgery<sup>21</sup> and drug-induced gingival overgrowth.<sup>22</sup>

The case presented here is in line with others in the literature, indicating that diode HPLs seem to be an efficient tool for conservative oral surgery procedures in patients on

anticoagulation medication therapy. Nevertheless, clinical and laboratory investigations (eg, coagulogram and international normalized ratio) should not be neglected.

#### ABBREVIATIONS

DOAC: direct oral anticoagulant

HPL: high-power laser

#### NOTE

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